WOLF CREEK
NUCLEAR OPERATING CORPORATION

Jaime H. McCoy
Vice President Engineering

September 2, 2015

ET 15-0022

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

Reference: Letter dated June 2, 2006 from D. Terao, USNRC, to R. A. Muench, WCNOC (ADAMS Accession No. ML061390135)

Subject: Docket No. 50-482: Fourth Ten-Year Interval Submittal Snubber Program Plan and Inservice Testing Program Plan

Gentlemen:

The purpose of this letter is to document Wolf Creek Nuclear Operating Corporation's (WCNOC) intent to comply with the requirements of 10 CFR 50.55a(b)(3)(v) for snubber visual examination and functional testing, as well as submitting the Inservice Testing (IST) Program plan for the IST Program fourth ten year interval. Previously, the snubber program had been managed under alternative requirements as described in Relief Request I3R-03, approved by the Nuclear Regulatory Commission (NRC) in the Reference. The fourth ten year inspection interval begins on September 4, 2015.

Enclosure I provides the Wolf Creek Generating Station (WCGS) Snubber Program Plan for the fourth ten year interval. The WCGS Snubber Program is being revised to implement the requirements of American Society of Mechanical Engineers (ASME) Operations and Maintenance (OM) Code, Subsection ISTD, 2004 Edition through 2006 Addenda. WCNOC is providing a Snubber Inspection and Testing Program plan in accordance with Subsection ISTA-3200, for the dynamic restraints (snubbers) at WCGS for the fourth inspection interval.

Enclosure II provides the WCGS Inservice Testing plan for the fourth ten year interval. The WCGS Inservice Testing Plan will implement the requirements of ASME OM Code, Subsection ISTB, ISTC, Mandatory Appendix I and Mandatory Appendix II, 2004 Edition through 2006 Addenda. In addition, WCNOC will implement the requirements of ASME Code Case OMN-1. WCNOC is providing an Inservice Testing Program plan in accordance with Subsection ISTA-3200, for the fourth inspection interval.

A047
NRR

This letter contains no commitments. If you have any questions concerning this matter, please contact me at (620) 364-4156, or Cynthia R. Hafenstine (620) 364-4204.

Sincerely,

Paul J. Herrman for

Jaime H. McCoy

JHM/rlt

Enclosures: I Wolf Creek Generating Station Snubber Examination, Testing, and Service Life Monitoring Program Plan Fourth 10-Year Inservice Testing Interval

II Wolf Creek Generating Station Inservice Testing Program for Pumps, Valves, and Snubbers

cc: M. L. Dapas (NRC), w/e
C. F. Lyon (NRC), w/e
N. H. Taylor (NRC), w/e
Senior Resident Inspector (NRC), w/e

# ENCLOSURE I

## Wolf Creek Generating Station Snubber Examination, Testing, and Service Life Monitoring Program Plan Fourth 10-Year Inservice Testing Interval

(6 pages)

# WCOP-29, Revision 0

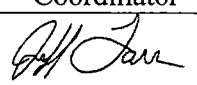
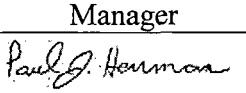
# Wolf Creek Generating Station

# Snubber Examination, Testing, and Service Life Monitoring Program Plan Fourth 10-Year Inservice Testing Interval

**Beginning September 4, 2015**
**Ending September 3, 2025**

**Wolf Creek**
**Nuclear Operating Company**
**PO Box 411**
**Burlington, KS 66839**

# Revision Log

| Effective Date | Revision Description | Prepared: IST Snubber Coordinator | Date | Approved: Engineering Manager | Date |
|---|---|---|---|---|---|
| 09/02/15 | Revision 0 |  | 09/02/15 |  Paul J. Herrman | 09/02/15 |
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**SECTION**

**INTRODUCTION:**

1.1 Purpose:

To provide requirements for the performance and administration of assessing the operational readiness of those dynamic restraints (Snubbers) whose specific functions are required to ensure the integrity of the reactor coolant pressure boundary or any safety-related system.

1.2 Scope:

The program plan was prepared to meet the requirements of the following subsections of the American Society of Mechanical Engineers (ASME) OM Code 2004 Edition with 2005 and 2006 Addenda.

- Subsection ISTA, "*General Requirements*"

  ISTA contains the requirements directly applicable to inservice examination and testing including the Owner's Responsibility and Records Requirements.

- Subsection ISTD, "*Preservice and Inservice Examination and Testing of Dynamic Restraints (Snubbers) in Light-Water Reactor Nuclear Power Plants*"

  ISTD establishes requirements for preservice and inservice examination and testing, and the service life monitoring of Dynamic Restraints *(Snubbers)* in light-water reactor nuclear power plants. The snubbers covered are required to support the systems and components that are required in shutting down a reactor to the safe shutdown condition, in maintaining the safe shutdown condition, or in mitigating the consequences of an accident.

1.3 Discussion:

In order to ensure the required operability of all safety related snubbers for Wolf Creek Generating Station (WCGS) during seismic or other events, initiating dynamic loads, the inspection, testing, and the service life monitoring of these snubbers shall be implemented and performed in accordance with the requirements of WCGS Snubber Program Document AP 29A-006.

The examination boundaries shall include the snubber assembly from pin to pin inclusive; however, the structural/piping attachments and fasteners may also be examined as described in the WCGS Snubber Program Document AP 29A-006. For supports containing snubbers that are selected for examination in the ISI program: The attachment hardware (Pin-to-Pipe and Pin-to-Building Structure) will be examined in accordance with ASME Section XI, subsection IWF.

The Snubber Program described in AP 29A-006 adheres to the requirements of the ASME OM Code, Subsection ISTD, 2004 Edition with 2005 and 2006 Addenda, as required by 10CFR50.55a(b)(3)(v).

B31.1 Non-Seismic Category 1 Snubbers will also be monitored in accordance with plant procedure AP 29A-006, Snubber Program Document.

## 2.0 EXAMINATION, TESTING AND SERVICE LIFE MONITORING REQUIREMENTS:

2.1 Visual Examinations, Functional Testing, and Service Life requirements shall be performed to the extent specified within AP 29A-006 and referenced Surveillance Test Procedures.

2.2 Snubbers are grouped into Defined Test Plan Groups (DTPGs) in accordance with ISTD-5252. Each DTPG will be tested using the 10% sample plan per ISTD-5300. There are no active snubbers attached to the Steam Generators.

| DTPG | Population Description | Sample Plan |
|---|---|---|
| 1 | Safety Related Size 1/4, 1/2 | 10% |
| 2 | Safety Related Size 1, 3, 10 | 10% |
| 3 | Safety Related Size 35, 100 | 10% |
| 4 | Safety Related Reduced Drag | 10% |

2.3 The service life of all snubbers shall be monitored and snubbers evaluated, replaced, or reconditioned in accordance with AP 29A-006, and ISTD-6200 to ensure that the service life is not exceeded between surveillance inspections. The replacement or reconditioning shall be documented and records retained in accordance with WCGS procedures.

## 3.0 EXAMINATION and TESTING METHODS:

3.1 Visual examinations shall be performed by individuals qualified in accordance with WCGS procedures. These examinations are conducted to ensure the mechanical and structural condition of the snubber support location and to observe conditions that could affect functional adequacy. Visual examinations and functional testing shall be performed to verify the requirements specified within AP 29A-006 are met in accordance with Subsection ISTD.

## 4.0 EXAMINATION and TESTING FREQUENCY:

4.1 Visual Examinations and Functional Testing shall be performed at the frequency specified within AP 29A-006 and ISTD-4250 and ISTD-5240. Snubbers are categorized as one population for visual examination according to the schedule determined by Table ISTD 4252-1.

4.2 Code Case OMN-13, which allows the extension of the visual examination interval, will be implemented for snubber inspections during this interval. Code Case OMN-13 is approved for use in Regulatory Guide 1.192 (June 2003). The Visual Examinations of Table ISTD 4252-1 may be extended in accordance with Code Case OMN-13 once the prerequisites of the code case have been satisfied.

4.3 Visual Examinations shall be performed whenever new snubbers are installed, reinstallation of existing or swapped snubbers that were functionally tested, or after repairs, replacements or modifications.

4.4 Functional testing requirements for new installations or spares shall be equal to or more stringent than that specified within AP 29A-006.

## 5.0 EXAMINATION, TESTING AND SERVICE LIFE MONITORING EVAUATION:

5.1 Snubbers that do not appear to conform to the Visual Examination requirements of AP 29A-006, shall be reported for evaluation and appropriate corrective action.

5.2 Snubbers that do not appear to conform to the visual examination acceptance requirements and are later confirmed as operable as a result of functional testing may be declared operable for the purpose of establishing the next visual inspection interval, providing that the unacceptable condition did not affect operational readiness for the snubber location.

5.3 Snubbers that do not meet the operability testing acceptance criteria in AP 29A-006 shall be evaluated to determine the cause of the failure and appropriate corrective action taken.

5.4 The service life of a snubber is evaluated using manufacturer's input and engineering information gained through consideration of the snubber service conditions and inservice functional test results. A service life monitoring program is included in AP 29A-006.

## 6.0 REPAIR, REPLACEMENT, AND MODIFICATION REQUIREMENTS:

6.1 Repairs, Replacements and Modifications performed on snubbers under this program shall conform, as applicable, to the requirements specified within the ASME Code, Section XI.

## 7.0 SCHEDULING:

7.1 The Visual Examinations, Functional Testing schedules, and Service Life Replacements shall be established, tracked and maintained in accordance with AP 29A-006, and Subsection ISTD by the Snubber Engineer.

7.2 The Snubber Engineer shall identify and track expanded or additional testing and/or examinations as required by AP 29A-006 and Subsection ISTD.

## 8.0 REPORTS and RECORDS:

8.1 Reports and records for the Visual Examinations and Functional Testing shall be maintained for all snubbers included within the Snubber Program.

8.2 Applicable records and reports, as required for Repair and Replacements, shall be maintained.

8.3 Records of the service life of all snubbers listed in this program, including the date at which the service life commences or expires, and associated installation and maintenance records shall be maintained.

# ENCLOSURE II

# Wolf Creek Generating Station Inservice Testing Program for Pumps, Valves, and Snubbers

# (184 pages)

# WCOP-02 REVISION 15

## Wolf Creek Generating Station

## Inservice Testing Program For Pumps, Valves, and Snubbers

## Commercial Service Date:

**Date: September 3, 1985**

**Wolf Creek Generating Station**
**P.O. Box 411**
**Burlington, KS 66839**

**APPROVALS:**

**Prepared By:** _____ **Date:** 9/2/15
**WCNOC IST Coordinator**

**Approved By:** _____ **Date:** 9/2/15
**WCNOC Programs Supervisor**

**Approved By:** Paul J. Herrman **Date:** 9/2/15
**WCNOC Engineering Manager**

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### SECTION

# 1.0 INTRODUCTION

## 1.1 Purpose

To provide requirements for the performance and administration of assessing the operational readiness of those pumps and valves whose specific functions are required to either:

a. Shutdown the reactor to the safe shutdown condition,
b. Maintain the safe shutdown condition, and/or
c. To mitigate the consequences of an accident.

The Wolf Creek Generating Station was designed and licensed to operate with the Hot Shutdown condition defined as the "safe" shutdown condition [USAR Section 7.4, Systems Required for Safe Shutdown].
The Inservice Inspection (ISI) Classification Boundaries are identical to the Design Classification or Quality Group Boundaries shown on the plant Piping and Instrument Diagrams (P&IDs) listed in Attachment 1. Some valves within the ISI Boundaries are identified as non-ASME Code Class (NC). This Inservice Testing (IST) Program was developed using the ISI Classification Boundaries and the following documents:

- Title 10, Code of Federal Regulations, Part 50, Paragraph 50.55a
- Standard Review Plan 3.9.6, "Inservice Testing of Pumps and Valves"
- Safety Analysis Report, Wolf Creek Generating Station
- Technical Specifications, Wolf Creek Generating Station
- NUREG-1482, Rev.2 "Guidelines for Inservice Testing at Nuclear Power Plants"

## 1.2 Scope

The IST program plan has been prepared to meet the requirements of the American Society of Mechanical Engineers (ASME) OM Code 2004 Edition through 2006 Addenda (ASME OM Code 2004/2006b). Mandatory Appendix II of the ASME OM Code 2004 Edition through 2006 Addenda will be used for check valve condition monitoring activities. Motor operated valve testing is based on the requirements of ASME Code Case OMN-1.

This program plan provides a complete listing of those pumps and valves included in the program per the requirements of the following:

a. ASME OM Code 2004/2006b, Subsection ISTA, *"General Requirements"*

   ISTA contains the requirements directly applicable to inservice testing including IST scope the Owner's Responsibility and Records Requirements.

b. ASME OM Code 2004/2006b, Subsection ISTB, *"Inservice Testing of Pumps in Light-Water Reactor Nuclear Power Plants"*

   ISTB establishes the requirements for inservice testing of pumps in light-water reactor nuclear power plants. The pumps covered are those provided with an

emergency power source, that are required in the shutting down the reactor to the safe shutdown condition, in maintaining the safe shutdown condition, and/or in mitigation of the consequences of an accident.

c. ASME OM Code 2004/2006b, Subsection ISTC, *"Inservice Testing of Valves in Light-Water Reactor Nuclear Power Plants"*

ISTC establishes the requirements for inservice testing of valves in light-water reactor nuclear power plants. The valves covered include those which provide overpressure protection and those which are required to perform a specific function, either actively through the changing of valve obturator position or passively by maintaining required obturator position in shutting down a reactor to the safe shutdown condition, in maintaining the safe shutdown condition, or in mitigating the consequences of an accident.

d. ASME OM Code 2004/2006b, Subsection ISTD, *"Preservice and Inservice Examination Testing of Dynamic Restraints (Snubbers) in Light-Water Reactor Nuclear Power Plants"*
Snubber testing shall be performed in accordance with the requirements of OM Code Subsection ISTD "Preservice and Inservice Examination and Testing of Dynamic Restraints (Snubbers) in Light-Water Reactor Nuclear Power Plants". In addition to any requirements specified in Subsection ISTA "General Requirements". The scope of snubber testing as well as applicable test requirements shall be defined in the WCGS Snubber Program, WCOP-29 *"Snubber Examination, Testing, and Service Life Monitoring Program Plan – Fourth Ten-Year Interval"*.

e. ASME OM Code 2004/2006b, Mandatory Appendix I, *"Inservice Testing of Pressure Relief Devices in Light-Water Reactor Nuclear Power Plants"*

Provides the requirements for performance testing and monitoring of nuclear plant pressure relief devices. Methods, intervals, and record requirements for monitoring and testing are established, as well as guidelines for the evaluation of results. The Appendix applies to safety valves, safety relief valves, thermal relief valves, pilot-operated pressure relief valves, power-actuated pressure relief valves, non-reclosing pressure relief devices and vacuum relief devices, including all accessories and appurtenances.

*f* ASME OM 2004/2006b, Mandatory Appendix II, *"Check Valve Condition Monitoring Program"*

Provides an alternative to the testing or examination requirements of ISTC-3520, 3540 and ISTC-5221. The purpose of this program is both to improve valve performance and to optimize testing, examination, and preventive maintenance activities in order to maintain the continued acceptable performance of a select group of check valves.

The Wolf Creek Generating Station fourth 120-month interval Pump and Valve Inservice Testing Plan will be in effect as follows:

**Begin** 09/04/2015 **End** 09/03/2025

## 2.0 INSERVICE TESTING PLAN FOR PUMPS

### 2.1 Pump Inservice Testing Plan Description

This testing program for valves meets the requirements of the ASME OM Code 2004 edition with Addenda through 2006, Section ISTB *"Inservice Testing of Pumps in Light-Water Reactor Nuclear Power Plants"*. Where these requirements have been determined to be impractical, specific requests for relief were written and are included in Attachment 3. NRC Generic Letter 89-04 and NUREG 1482, Revision 2 have been used as guidance in the development of the IST Program.

### 2.2 Pump Plan Table Description

The pumps included in the Wolf Creek Generating Station IST Plan are listed in Attachment 14. The information contained within these tables identifies those pumps which are to be tested to the requirements of Subsection ISTB of the ASME OM Code 2004 Edition through 2006 Addenda, the testing parameters and frequencies, and associated relief requests. The headings for the pump tables are delineated below.

| | |
|---|---|
| Pump Number | Unique pump identification number |
| P&ID Number | The Wolf Creek Drawing Number that the pump is indicated |
| P&ID Coord | The drawing coordinate location of the pump on the P&ID |
| IST Group | Pump group as defined in ISTB-2000<br>Group A Continuous or routinely operated pumps<br>Group B Standby pumps not operated routinely |
| ISI Class | ASME ISI Code classification of the pump |
| IST Requirements | PUMP SPEED, DIFFERENTIAL PRESSURE, FLOW RATE, VIBRATION: When the letter "Y" for "YES" appears in a particular test quantity column, that quantity will be measured or observed during Inservice Testing in accordance with ASME OM Code ISTB. If a modified test is planned or a test is being waived, a request for relief number will appear in the test quantity column, referencing the pump's relief request. Requests for relief are identified as 4PR-X, where X is the sequential number of the relief. The requests for relief are included in Attachment 3. |

### 2.3 Measurement of Test Quantities

| | |
|---|---|
| Speed (SPD) | Per ASME OM Code ISTB-3530, rotational speed measurement of variable speed pumps shall be taken by a method, which meets the requirements of paragraph ISTB-3510. |
| Differential Pressure | Differential pressure will be calculated from inlet and discharge pressure measurements or by direct differential pressure measurement. |

## 2.3 Measurement of Test Quantities (continued)

| | |
|---|---|
| Flow Rate | Flow rate will be measured using a rate or quantity meter installed in the pump test circuit. |
| Vibration (VIBR TEST) | Pump vibration will be measured with a digital vibration meter in accordance with the applicable section of ASME OM Code ISTB-3540. |

## 2.4 Allowable Ranges of Test Quantities

The applicable allowable ranges specified in ASME OM Code ISTB, Tables ISTB-5121-1, ISTB-5221-1, ISTB-5321-1, and ISTB-5321-2, as applicable, will be used for differential pressure, flow, and vibration measurements. Should a measured test quantity fall outside the allowable range, corrective action per ASME OM Code ISTB-6200 shall be followed and records maintained in accordance with ASME OM Code ISTB-9000.

## 2.5 Instrument Accuracy

Allowable instrument accuracy's are provided in ASME OM Code Table ISTB-3510-1. If the accuracies of the station's instruments do not meet the requirements of this table/section, temporary instruments meeting those requirements in Table ISTB-3510-1 will be used.

## 2.6 Reference Value Accuracy

ASME OM Code ISTB requires that reference conditions be established prior to the commencement of testing. ASME OM Code ISTB-3510(b)(1) states that the range of analog instruments can be no more than 3 times the reference value. The allowable accuracy of the reference condition instruments is 2%. To be within Code Accuracy requirements, a variance from the reference condition up to 2% of the reference value minus the accuracy of the flow gauge may be allowed.

## 3.0 INSERVICE TESTING PLAN FOR VALVES

### 3.1 Valve Inservice Testing Plan Description

This testing program for valves meets the requirements of the ASME OM Code 2004 edition with addenda through 2006, Section ISTC *"Inservice Testing of Valves in Light-Water Reactor Nuclear Power Plants"*; Mandatory Appendix I *"Inservice Testing of Pressure Relief Devices in Light-Water Reactor Nuclear Power Plants"*; Mandatory Appendix II *"Check Valve Condition Monitoring Program"*; and ASME Code Case OMN-1, Rev.0, *"Alternative Rules for Preservice and Inservice Testing of certain Electric Motor Operated Valve Assemblies in Light-Water Reactor Nuclear Power Plants"*. Where these requirements are determined to be impractical, specific requests for relief have been written and are included in Attachment 5.

### 3.2 Valve Plan Table Description

The table in Attachment 15 list all ASME Class 1, 2, 3, and NC Valves that have been scoped to be within the IST Program, and have been assigned Valve Categories. Valves exempt per ASME OM Code ISTC-1200 are not listed. The following information is included for each valve.

Valve Number — The Valve Identification Number

P&ID Number — The Identification Number of the drawing on which the valve can be located

P&ID Coordinate — The drawing coordinate location on the P&ID for the valve

IST Class — The ASME Classification of the valve (NC=Non ASME Code Class)

IST Category — The category(s) assigned to the valve based on the definitions per ASME OM Code ISTC-1300. The following categories are defined in the Code:

Category A – Valves for which seat leakage is limited to a specific maximum amount in the closed position for fulfillment of their function.

Category B – Valves for which seat leakage in the closed position is inconsequential for fulfillment of their function.

Category C – Valves, which are self-actuating in response to some system characteristic, such as pressure (relief valves) or flow direction (check valves).

Category D – Valves, which are actuated by an energy source capable of only one operation, such as rupture disks or explosive-actuated valves.

Valve Size — The nominal size of the valve in inches

## 3.2 Valve Plan Table Description (continued)

Valve Type

The Valve Body Design as indicated by the following abbreviations:

| | |
|---|---|
| ANGLE | ANG |
| BALL | BAL |
| BUTTERFLY | BTF |
| CHECK | CK |
| DIAPHRAGM | DIA |
| GATE | GA |
| GLOBE | GL |
| RELIEF | RV |
| RUPTURE DIAPHRAGM | RPD |
| SAFETY | SV |
| STOP CHECK | SCK |
| THREE WAY | TWY |

ACT Type

The type of Valve Actuator as indicated by the following abbreviations:

| | |
|---|---|
| MOTOR OPERATION | MO |
| AIR OPERATOR | AO |
| SOLENOID OPERATOR | SO |
| HYDRAULIC OPERATOR | HO |
| MANUAL | M |
| SELF ACTUATED | SA |

SAFETY POS

The normal position of the valve during regular plant operation, specified as follows:

| | |
|---|---|
| O | OPEN |
| C | CLOSED |
| L | LOCKED |
| T | THROTTLED |

ACTIVE/PASS

This field identifies the Active or Passive classification as defined by ISTA-2000

TEST RQMT

The test(s) that will be performed to fulfill the requirements of ASME OM Code ISTC. The definitions and abbreviations are identified below:

| | |
|---|---|
| AT-1 | Type C Leak Test<br>Containment Isolation Valves will be Seat Leak Tested in accordance with WCGS Technical Specification Requirements and Appendix J, 10 CFR 50. (ISTC-3620) |

## 3.2 Valve Plan Table Description (continued)

| | |
|---|---|
| AT-2 | Pressure Isolation Valve Leak Test<br>Those valves so designated will be Leak Tested in accordance with WCGS Technical Specification SR 3.4.14.1. (ISTC-3630) |
| AT-3 | Accumulator Check Valve Test<br>Check valves designed to maintain air-accumulator charge upon loss of normal plant service or Instrument Air will be subjected to air pressure drop. (ISTC-3630) |
| AT-4 | Other Analyzed Valves Leak Test<br>AT-1, AT-2, or AT-3, but for which seat leakage is required to be limited to a specific maximum amount will be leak tested. (ISTC-3630) |
| BT-O | Full-Stroke Exercise Test to the Open Position for power operated valves exercise testing in the open direction verified by Stroke Time Measurement, will be performed to confirm the full stroke capability of each valve. The stroke direction tested and timed (OPEN) is based on the direction the Valve Disk must travel to fulfill a safety function. (ISTC-3521, 5000) |
| BT-C | Full-Stroke Exercise Test to the Closed Position for power operated valves exercise testing in the closed direction, verified by Stroke Time Measurement, will be performed to confirm the full stroke capability of each valve. The stroke direction tested and timed (CLOSE) is based on the direction the Valve Disk must travel to fulfill a safety function. (ISTC-3521, 5000) |
| BT-E | Full Stroke Exercise (No timing required)<br>Exercise in both the open and closed direction will be performed to confirm the full stroke capability of each valve during the period of time between MOV Operability and Functional Margin determination tests. (OMN-1) |
| CVT-O | Check Valve Exercise Test to Open Position. Check Valves will be verified in the full OPEN Position. Verification of Safety Basis System Flow through a check valve shall be an adequate demonstration the valve is full OPEN. (ISTC-3522, 5221) |

**3.2 Valve Plan Table Description (continued)**

| | |
|---|---|
| CVT-C | Check Valve Exercise to the Closed Position.<br>If a check valve performs a safety function in only the closed direction it shall be exercised by initiating flow and observing that the obturator has traveled at least the partially open position, and verify that on cessation or reversal of flow, the obturator has traveled to the seat. If the check valve performs a safety function in the closed position, the normal position for the valve is closed, and position can be verified during normal plant operation, then quarterly documentation will be performed to meet ASME Code requirements. If a valve performs a safety function in both the open and closed position, the valve will be exercised to the open position and then be verified to close. (ISTC-3522, 5221) |
| RVT | Relief Valve Setpoint Verification Test<br>Relief and Safety Valve set point will be verified. (ASME Mandatory Appendix I) |
| FST | Fail-Safe Test<br>Valves with fail-safe actuators will be tested to verify proper fail-safe operation upon loss of actuator power. (ISTC-3560) |
| OMN1-O | Code Case OMN-1 Test in the Open Direction<br>Exercise Test in the OPEN direction used to gather information for the determination of a MOVs functional margin in the OPEN direction. |
| OMN1-C | Code Case OMN-1 Test in the Closed Direction<br>Exercise Test in the CLOSED direction used to gather information for the determination of a MOVs functional margin in the CLOSED direction. |
| PIT | Position Indication Verification Test<br>Valves with remote position indicators will be tested to verify the indicator accurately reflects valve position. (ISTC-3700) |
| RPL | Replacement<br>Non-reclosing pressure relief devices will be replaced on a periodic basis. (I-1360) |

## 3.2 Valve Plan Table Description (continued)

TEST FREQ

The frequency at which the "identified", or "applicable" test will be performed. The definitions and abbreviations are identified below:

| Test Frequency | Operational Condition (1) | Frequency of Testing |
|---|---|---|
| Q | (3) | At least once per 92 days |
| M | (3) | At least once per 31 days |
| CS | (2) | Cold Shutdown |
| RC | (3) | Once per Refueling Cycle or Year (whichever is greater) |
| RR | (4) | Each Reactor Refueling Outage |
| APP J | (3) | In accordance with 10CFR50 Appendix J (not to exceed 60 Months) |
| CM | (3) | Check Valve Condition Monitoring Program frequency |
| 1.5Y | (3) | At least once per 18 months |
| 2Y | (3) | Every two years |
| 5Y | (3) | Every five years |
| 10Y | (3) | Every ten years |
| JOG | (3) | Per the MOV Program, not to Exceed 10 years |
| SDE | (3) | Sample Disassembly And Examination at refueling |

Operation Conditions:

(1) Operational conditions are defined in the WCGS Technical Specifications

(2) Inservice valve testing will commence within 48 hours of reaching the Cold Shutdown conditions as defined in the WCGS Technical Specifications. Testing not completed before Startup may be completed during subsequent Cold Shutdowns. Valve testing need not be performed more often than once every three months. In the case of extended Cold Shutdowns, the testing need not be started within the 48 hours limitation. However, in these instances, all valve testing must be completed prior to Startup.

(3) Specific operational conditions are stated in the Surveillance Procedure directing the test.

(4) All valve testing required to be performed during a refueling outage shall be completed before returning the plant to operation at power.

## 4.0 ATTACHMENTS:

**Attachment 1**
System and P&ID Listing

**Attachment 2**
Generic and Pump Relief Request Index

**Attachment 3**
Generic and Pump Relief Requests

**Attachment 4**
Valve Relief Request Index

**Attachment 5**
Valve Relief Requests

**Attachment 6**
Cold Shutdown Justification Index

**Attachment 7**
Cold Shutdown Justifications

**Attachment 8**
Refuel Outage Justification Index

**Attachment 9**
Refuel Outage Justifications

**Attachment 10**
Check Valve Condition Monitoring Plan Basis Index

**Attachment 11**
Check Valve Condition Monitoring Plan Basis

**Attachment 12**
Technical Positions Index

**Attachment 13**
Technical Positions

**Attachment 14**
Inservice Testing Pump Table

**Attachment 15**
Inservice Testing Valve Table

## ATTACHMENT 1

## SYSTEM AND P&ID LISTING

| System | System Name | P&ID |
|---|---|---|
| AB | Main Steam | M-12AB01, 02 |
| AE | Main Feedwater | M-12AE02 |
| AL | Auxiliary Feedwater (AFW) | M-12AL01 |
| AP | Condensate Storage and Transfer | M-12AP01 |
| BB | Reactor Coolant | M-12BB01, 02, 03, 04 |
| BG | Chemical & Volume Control (CVCS) | M-12BG01, 02, 03, 04, 05 |
| BL | Reactor Make-Up Water | M-12BL01 |
| BM | Steam Generator Blowdown | M-12BM01 |
| BN | Borated Refueling Water Storage | M-12BN01 |
| EC | Fuel Pool Cooling and Clean-Up | M-12EC01, 02 |
| EF | Essential Service Water (ESW) | M-K2EF01, M-12EF01, 02 |
| EG | Component Cooling Water | M-12EG01, 02, 03 |
| EJ | Residual Heat Removal (RHR) | M-12EJ01 |
| EM | High Pressure Coolant Injection | M-12EM01, 02 |
| EN | Containment Spray | M-12EN01 |
| EP | Accumulator Safety Injection | M-12EP01 |
| FC | Auxiliary Turbine – Auxiliary Feedwater | M-12FC02 |
| GS | Containment Hydrogen Control | M-12GS01 |
| GT | Containment Purge | M-12GT01 |
| HB | Liquid Radwaste | M-12HB01 |
| HD | Decontamination | M-12HD01 |
| JE | Emergency Fuel Oil | M-12JE01 |
| KA | Compressed Air | M-12KA01, 02, 05 |
| KB | Containment Breathing Air | M-12KB01 |
| KC | Fire Protection | M-12KC02 |
| KJ | Standby Diesel Generator | M-12KJ01, 02, 03, 04, 05, 06 |
| LF | Reactor Building and Hot Machine Shop Floor and Equipment Drain | M-12LF03, 09 |
| SJ | Nuclear Sampling | M-12SJ01, 04 |

## ATTACHMENT 2

## GENERIC AND PUMP RELIEF REQUEST INDEX

| Relief Request No. | Description | NRC Approval Date |
|---|---|---|
| 4GR-1 | IST Frequency Grace | 8/10/2015 Letter 15-00695 |
| 4PR-1 | Ranges for Pump Reference Values per Code Case OMN-21 | 5/15/2015 Letter 15-00547 |
| 4PR-2 | Centrifugal Charging Pump Suction Pressure Gauge Range Requirements | 5/15/2015 Letter 15-00547 |

## ATTACHMENT 3

## GENERIC and PUMP RELIEF REQUESTS

## 10 CFR 50.55a Relief Request 4GR-1

## IST Frequency Grace

## Proposed Alternative

## In Accordance with 10 CFR 50.55a(z)(2)

## Hardship or Unusual Difficulty

## Without Compensating Increase in Level of Quality and Safety

1. **ASME Code Component(s) Affected**

   All Pumps and Valves contained within the Inservice Testing Program scope.

2. **Applicable Code Edition and Addenda**

   ASME OM Code-2004 Edition, with Addenda through OMb-2006

3. **Applicable Code Requirement(s)**

   This request applies to the frequency specifications of the ASME OM Code. The frequencies for tests given in the ASME OM Code do not include a tolerance band.

   ISTA-3120(a) – "The frequency for inservice testing shall be in accordance with the requirements of Section IST."

   ISTB-3400 – Frequency of Inservice Tests; "An inservice test shall be run on each pump as specified in Table ISTB-3400-1" Table ISTB-3400-1 lists two frequencies – quarterly and biennially.

   ISTC-3510 – Exercising Test Frequency; "Active Category A, Category B, and Category C check valves shall be exercised nominally every 3 months,..."

   ISTC-3540 – Manual Valves; "Manual Valves shall be full-stroke exercised at least once every 2 years, except where adverse conditions may require the valve to be tested more frequently to ensure operational readiness."

   ISTC-3630(a) – Frequency; "Tests shall be conducted at least once every 2 years."

   ISTC-3700 – Position Verification Testing; "Valves with remote position indicators shall be observed locally at least once every 2 years to verify that valve operation is accurately indicated."

   ISTC-5221(c)(3) – "At least one valve from each group shall be disassembled and examined at each refueling outage; all valves in a group shall be disassembled and examined at least once every 8 years."

   Appendix I, I-1320 – Test Frequencies, Class 1 Pressure Relief Valves; "Class 1 pressure relief valves shall be tested at least once every 5 years..."

   Appendix I, 1-1340 – Test Frequency, Class 1 Pressure Relief Valves that are used for Thermal Relief Application; Refers to I-1320 for test frequency.

## 10 CFR 50.55a Relief Request 4GR-1

### IST Frequency Grace (Continued)

Appendix I, 1-1350 – Test Frequency, Classes 2 and 3 Pressure Relief Valves; "Classes 2 and 3 pressure relief valves, with the exception of PWR main steam safety valves, shall be tested every 10 years, ..."

Appendix I, 1-1360 – Test Frequency, Classes 2 and 3 Nonreclosing Pressure Relief Devices; "Classes 2 and 3 nonreclosing pressure relief devices shall be replaced every 5 years, ..."

Appendix I, 1-1370 – Test Frequency, Classes 2 and 3 Primary Containment Vacuum Relief Valves; "Tests shall be performed on all Classes 2 and 3 containment vacuum relief valves at each refueling outage or every 2 years, ..."

Appendix I, 1-1380 – Test Frequency, Classes 2 and 3 Vacuum Relief Valves Except for Primary Containment Vacuum Relief Valves; "All Classes 2 and 3 vacuum relief valves shall be tested every 2 years, ..."

Appendix I, 1-1390 – Test Frequency, Classes 2 and 3 Pressure Relief Devices that are used for Thermal Relief Application; "Tests shall be performed on all Classes 2 and 3 relief devices used in thermal relief application every 10 years, ...."

Appendix II, II-4000(a)(1)(e) – Performance Improvement Activities; Subparagraph (1)(e) requires the identification of the interval for each activity.

Appendix II, II-4000(b)(1)(e) – Optimization of Condition Monitoring Activities; Subparagraph (1)(e) requires the identification of the interval for each activity.

**4. Reason for Request**

Pursuant to 10 CFR 50.55a(z)(2), an alternative is requested to the frequency specifications of the ASME OM Code. The basis of this request is that the Code requirements present an undue hardship without a compensating increase in the level of quality or safety.

## 10 CFR 50.55a Relief Request 4GR-1

### IST Frequency Grace
### (Continued)

ASME OM Code Section IST establishes the inservice test frequencies for all components within the scope of the Code. The frequencies (e.g., quarterly) have always been interpreted as "nominal" frequencies (generally as defined in Table 3.2 of NUREG 1482, Revision 2) and Owners routinely applied the surveillance extension time period (i.e., grace period) contained in the plant Technical Specifications (TS) Surveillance Requirements (SRs). The TS typically allow for a less than or equal to 25 percent extension of the surveillance test interval to accommodate plant conditions that may not be suitable for conducting the surveillance (SR 3.0.2). However, regulatory issues have been raised concerning the applicability of the TS "Grace Period" to ASME OM Code required inservice test frequencies irrespective of allowances provided under TS Administrative Controls (i.e., TS 5.5.8, "Inservice Testing Program," invokes SR 3.0.2 for various OM Code frequencies of 2 years or less).

The lack of a tolerance band on the ASME OM Code inservice test frequencies restricts operational flexibility. There may be a conflict where a surveillance test is required (i.e., its Frequency could expire), but where it is not possible or not desired that the test be performed until sometime after a plant condition or associated Limiting Condition for Operation (LCO) is within its applicability. Therefore, to avoid this conflict, the surveillance test should be performed when it can be and should be performed.

The NRC recognized this potential issue in the TS by allowing a frequency tolerance as described in TS SR 3.0.2. The lack of a similar tolerance applied to OM Code testing places an unusual hardship on the plant to adequately schedule work tasks without operational flexibility.

As with TS required surveillance testing, some tolerance is needed to allow adjusting OM Code testing intervals to suit the plant conditions and other maintenance and testing activities. This assures operational flexibility when scheduling surveillance tests that minimize the conflicts between the need to complete the surveillance and plant conditions.

**5. <u>Proposed Alternative and Basis for Use</u>**

The ASME OM Code establishes component test frequencies that are based either on elapsed time periods (e.g., quarterly, 2 years, etc.) or on the occurrence of plant conditions or events (e.g., cold shutdown, refueling outage, upon detection of a sample failure, following maintenance, etc.).

a. Components whose test frequencies are based on elapsed time periods shall be tested at the frequencies specified in OM Code Section IST with a specified time period between tests as shown in Table 1. The specified time period between tests may be reduced or extended as follows:

## 10 CFR 50.55a Relief Request 4GR-1

### IST Frequency Grace
### (Continued)

1) For periods specified as less than 2 years, the period may be extended by up to 25% for any given test.

2) For periods specified as greater than or equal to 2 years, the period may be extended by up to 6 months for any given test.

3) All periods specified may be reduced at the discretion of the owner (i.e., there is no minimum period requirement).

Period extension is to facilitate test scheduling and considers plant operating conditions that may not be suitable for performance of the required testing (e.g., performance of the test would cause an unacceptable increase in the plant risk profile due to transient conditions or other ongoing surveillance, test or maintenance activities). Period extensions are not intended to be used repeatedly merely as an operational convenience to extend test intervals beyond those specified.

Period extensions may also be applied to accelerated test frequencies (e.g., pumps in Alert Range) and other fewer than two year test frequencies not specified in Table 1.

Period extensions may not be applied to the test frequency requirements specified in Subsection ISTD, Preservice and Inservice Examination and Testing of Dynamic Restraints (Snubbers) in Light-Water Reactor Nuclear Power Plants, as Subsection ISTD contains its own rules for period extensions.

b. Components whose test frequencies are based on the occurrence of plant conditions or events (e.g., cold shutdown, refueling outage, upon detection of a sample failure, following maintenance, etc.) may not have their period between tests extended except as allowed by ASME OM Code-2004 Edition through OMb-2006 Addenda and earlier editions and addenda of the ASME OM Code.

Table 1 Specified Test Frequencies

| Frequency | Specified Time Period Between Tests |
|---|---|
| Quarterly<br>(or every 3 months) | 92 days |
| Semiannually<br>(or every 6 months) | 184 days |
| Annually<br>(or every year) | 366 days |
| x Years | x calendar years<br>where 'x' is a whole number of years ≥ 2 |

## 10 CFR 50.55a Relief Request 4GR-1
## IST Frequency Grace
## (Continued)

This proposed alternative is consistent with ASME approved Code Case OMN-20. Using the provisions of this request as an alternative to the specific frequency requirements of the OM Code identified above will provide operational flexibility and still continue to provide an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(z)(2) WCGS requests approval of the alternative to the specific ASME OM Code frequency requirements identified in this request

**6. Duration of Proposed Alternative**

The proposed alternative identified will be utilized during the fourth IST interval which is scheduled to begin September 4, 2015 and conclude on September 3, 2025.

**7. Precedents**

A similar request (RV-01) was approved for Quad Cities Nuclear Power Station (NRC Docket Nos. 50-254 and 50-265), as discussed in the U.S. Nuclear Regulatory Commission Safety Evaluation Report dated February 14, 2013 (ML 13042A348)

A similar request (VR-02) was approved for Three Mile Nuclear Station, Unit 1 (NRC Docket No. 50-289), as discussed in the U.S. Nuclear Regulatory Commission Safety Evaluation Report dated August 15, 2013 (TAC Nos. MF0046, MF0047, and MF0048)

**8. References**

WCGS TS Section 1.4 – Frequency

WCGS TS Section 3.0.2 – Limiting Conditions for Operations (LCO) Applicability

WCGS TS Section 5.5.8 – Inservice Testing Program

## 10 CFR 50.55a Request 4PR-1

## Ranges for Pump Reference Values per Code Case OMN-21

## Proposed Alternative
## In Accordance with 10 CFR 50.55a(z)(1)

## Alternative Provides Acceptable Level of Quality and Safety

### 1. ASME Code Component(s) Affected

| Pump Number | Description | Pump Type | ASME Code Class | OM Code Category |
|---|---|---|---|---|
| PBG02A/B | Boric Acid Pumps | Centrifugal | 3 | Group A |
| PEG01A/B/C/D | Component Cooling Water Pumps | Centrifugal | 3 | Group A |
| PEJ01A/B | Residual Heat Removal Pumps | Centrifugal | 2 | Group A |
| PEC01A/B | Fuel Pool Cooling Pumps | Centrifugal | 3 | Group A |
| PAL01A/B | Motor Driven Auxiliary Feedwater Pumps | Centrifugal | 3 | Group B |
| PAL02 | Turbine Driven Auxiliary Feedwater Pumps | Centrifugal | 3 | Group B |
| PBG05A/B | Centrifugal Charging Pumps | Centrifugal | 2 | Group B |
| PEF01A/B | Essential Service Water Pumps | Vertical Line Shaft | 3 | Group B |
| PEM01A/B | Safety Injection Pumps | Centrifugal | 2 | Group B |
| PEN01A/B | Containment Spray Pumps | Centrifugal | 2 | Group B |

### 2. Applicable Code Edition and Addenda

ASME OM Code 2004 Edition through 2006 Addenda

## 10 CFR 50.55a Request 4PR-1

## Ranges for Pump Reference Values per Code Case OMN-21 (Continued)

### 3. Applicable Code Requirements

ISTB-5121, "Group A Test Procedure", para. (b) states, in part, that; The system resistance shall be varied until flow rate or alternatively, differential pressure reaches the reference point.

ISTB-5122, "Group B Test Procedure", para. (c) states that; The system resistance may be varied as necessary to achieve the reference point.

ISTB-5123, "Comprehensive Test Procedure", para. (b) states, in part, that; For centrifugal and vertical line shaft pumps, the system resistance shall be varied until flow rate or alternatively, differential pressure reaches the reference point.

ISTB-5221, "Group A Test Procedure", para. (b) states, in part, that; The system resistance shall be varied until flow rate or alternatively, differential pressure reaches the reference point.

ISTB-5222, "Group B Test Procedure", para. (c) states that; The system resistance may be varied as necessary to achieve the reference point.

ISTB-5223, "Comprehensive Test Procedure", para. (b) states, in part, that; The system resistance shall be varied until flow rate or alternatively, differential pressure reaches the reference point.

### 4. Reason for Request

Pursuant to 10 CFR 50.55a, "Codes and Standards," paragraph (z)(1), an alternative is proposed to the pump testing reference value requirements of the ASME OM Code. The basis of the request is that the proposed alternative would provide an acceptable level of quality and safety. Specifically, this alternative is requested for all inservice testing of IST Program pumps identified above.

For pump testing, there is difficulty adjusting system throttle valves with sufficient precision to achieve exact flow reference values during subsequent IST exams. Section ISTB of the ASME OM Code does not allow for variance from a fixed reference value for pump testing. However, NUREG-1482, Revision 2, Section 5.3, acknowledges that certain pump system designs do not allow for the licensee to set the flow at an exact value because of limitations in the instruments and controls for maintaining steady flow.

## 10 CFR 50.55a Request 4PR-1

## Ranges for Pump Reference Values per Code Case OMN-21 (Continued)

### 4. Reason for Request (Cont)

ASME OM Code Case OMN-21 provides guidance for adjusting reference flow/ΔP to within a specified tolerance during Inservice Testing. The Code Case states "It is the opinion of the Committee that when it is impractical to operate a pump at a specified reference point and adjust the resistance of the system to a specified reference point for either flow rate, differential pressure or discharge pressure, the pump may be operated as close as practical to the specified reference point with the following requirements. The Owner shall adjust the system resistance to as close as practical to the specified reference point where the variance from the reference point does not exceed plus 2% or minus 1% of the reference point when the reference point is flow rate, or plus 1% or minus

### 5. Proposed Alternative and Basis for Use

Wolf Creek Nuclear Operating Corporation (WCNOC) prefers to perform future Inservice Pump testing in a manner consistent with the requirements as stated in ASME OM Code Case OMN-21. Specifically, testing of all pumps will be performed such that flow rate is adjusted as close as practical to the reference value and within proceduralized limits of plus 2% / minus 1% of the reference value.

WCNOC plant operators will still strive to achieve the exact test flow reference values during testing. Typical test guidance will be to adjust flow to the specific reference value with additional guidance that if the reference value cannot be achieved with reasonable effort the test will be considered valid if the steady state flow rate is within the proceduralized limits of plus 2% / minus 1% of the reference value.

Code Case OMN-21 was approved by the ASME Operations and Maintenance Standards Committee on April 20, 2012, with an NRC representative voting in the affirmative. The applicability of Code Case OMN-21 is the ASME OM Code 1995 Edition through 2011 Addenda. The language from Code Case OMN-21 has been included in the ASME OM Code 2012 Edition.

Using the provisions of this request as an alternative to the specific requirements of ISTB-5121, ISTB-5122, ISTB-5123, ISTB-5221, ISTB-5222 and ISTB-5223 as described above will provide adequate indication of pump performance and continue to provide an acceptable level of quality and safety.

## 10 CFR 50.55a Request 4PR-1

## Ranges for Pump Reference Values per Code Case OMN-21 (Continued)

### 6. Duration of Proposed Alternative

This proposed alternative will be utilized for the entire 4th 120 month interval which will begin September 4, 2015 and conclude on September 3, 2025.

### 7. Precedents

Callaway Plant, Unit 1 – Safety Evaluation – Requests for Relief PR-01 through PR-6, Alternatives to ASME OM Code Requirements for Inservice Testing for the Fourth Program Interval (TAC Nos. MF2784, MF2785, MF2786, MF2787, MF2788 and MF2789) July 15, 2014

## 10 CFR 50.55a Request 4PR-02

## Centrifugal Charging Pump Suction Pressure Gauge Range Requirements

**Proposed Alternative**
**In Accordance with 10 CFR 50.55a(z)(1)**

**Alternative Provides Acceptable Level of Quality and Safety**

### 1. ASME Code Component(s) Affected

| | |
|---|---|
| PBG05A | Centrifugal Charging Pump A |
| PBG05B | Centrifugal Charging Pump B |

### 2. Applicable Code Edition and Addenda

ASME OM Code 2004 Edition through 2006 Addenda

### 3. Applicable Code Requirement

ISTB-3510(b)(1) – The full-scale range of each analog instrument shall be not greater than three times the reference value.

### 4. Reason for Request

Pursuant to 10 CFR 50.55a, "Codes and Standards", paragraph (a)(3)(i), relief is requested from the requirement of ASME OM Code ISTB-3510(b)(1). The basis of the request is that the proposed alternative would provide an acceptable level of quality and safety.

The installed suction pressure gauge range of the Centrifugal Charging Pumps is 0 – 150 psig. The reference values for suction pressure during Inservice Testing are between 30 and 40 psig. As a result, the instrument range exceeds the requirement of ISTB-3510(b)(1).

### 5. Proposed Alternative and Basis for Use

Pump suction pressure is used along with pump discharge pressure to determine pump differential pressure. Reference values for the Centrifugal Charging Pumps during Inservice Testing are between 30 psig and 40 psig. Based on ISTB-3510(b)(1), this would require as a maximum, a gauge with a range of 0 to 90 psig (3 X 30 psig) to bound the lowest reference value for pressure. Applying the accuracy requirement of ± 2 % for the quarterly Group B pump test, the resulting inaccuracies due to pressure effects would be ± 1.8 psig (0.02 X 90 psig).

## 10 CFR 50.55a Request 4PR-02

## Centrifugal Charging Pump Suction Pressure Gauge Range Requirements (Continued)

### 5. Proposed Alternative and Basis for Use (Cont)

As an alternative, for the Group B quarterly test, Wolf Creek Nuclear Operating Corporation (WCNOC) will use the installed suction pressure gauge (0 to 150 psig) calibrated to less than ± 1.2 % such that the inaccuracies due to pressure will be less than that required by the Code (± 1.8 psig). Use of the installed pressure gauge calibrated to less than ± 1.2 % is equivalent in terms of measuring differential pressure.

Although the permanently installed discharge pressure gauges are above the maximum range limits of ASME OM Code ISTB-3510(b)(1), they are within the accuracy requirements and are therefore suitable for the test. Reference NUREG 1482 Revision 2, Section 5.5.1.

Using the provisions of this relief request as an alternative to the specific requirements of ISTB-3510(b)(1) identified above will provide adequate indication of pump performance and continue to provide an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(z)(1), we request relief from the specific ISTB requirements identified in this request.

### 6. Duration of Proposed Alternative

This proposed alternative will be utilized for the entire 4$^{th}$ 120 month interval which will begin September 4, 2015 and conclude on September 3, 2025.

### 7. Precedents

Wolf Creek Generating Station – Safety Evaluation – Relief Requests for the Third 10-Year Pump and Valve Inservice Testing Program (TAC Nos. MC8210, MC8212, MD0383, and MD0384) 3/21/2006

## ATTACHMENT 4

## VALVE RELIEF REQUEST INDEX

| Relief Request No. | Description | NRC Approval Date |
|---|---|---|
| 4VR-01 | Set Pressure Measurement Accuracy | 8/10/2015<br>Letter 15-00695 |

**ATTACHMENT 5**

**VALVE RELIEF REQUESTS**

## 10 CFR 50.55a Request 4VR-01

## Set Pressure Measurement Accuracy

## Proposed Alternative
## In Accordance with 10 CFR 50.55a(z)(1)

## Alternative Provides Acceptable Level of Quality and Safety

### 1. ASME Code Component(s) Affected

| Valve No. | Class | Category |
|---|---|---|
| ENV0058 | 2 | C |
| ENV0106 | 2 | C |

### 2. Applicable Code Edition and Addenda

ASME OM Code 2004 Edition through OMb-2006 Addenda

### 3. Applicable Code Requirement

Appendix I, I-1410 – *Set-Pressure Measurement Accuracy.* Test equipment (e.g., gages, transducers, load cells, calibration standards) used to determine valve set-pressure, shall have an overall combined accuracy not to exceed +/-1% of the indicated (measured) set-pressure.

### 4. Reason for Request

Pursuant to 10 CFR 50.55a, "Codes and Standards", paragraph (z)(1), relief is requested from the requirement of ASME OM Code Appendix I, I-1410. The basis of the relief request is that the proposed alternative would provide an acceptable level of quality and safety.

ENV0058 and ENV0106 - These vacuum relief valves must open to provide vacuum protection of the spray additive tank. This function prevents the tank from collapsing in the event of a failure of the discharge isolation valves to close while the tank is empty and the pumps are operating. This condition could cause a vacuum to be created within the tank. The valve is set to relieve vacuum at 0.98 psig vacuum.

Typically, vacuum relief valves are designed to relieve at significantly low differential pressures. For the subject valves, the set pressures are as follows:

Spray Additive Vacuum Relief Valves 2" Hg (0.98 psig)

## 10 CFR 50.55a Request 4VR-01

### Set Pressure Measurement Accuracy (Continued)

Instrument accuracies to meet the Code requirements would therefore be 0.0098 psig. Pressure instrumentation that provides this level of accuracy for this application is not commercially available and not typically maintained by a power plant facility. As a result, the instrument accuracy range will exceed the requirements of Appendix I, I-1410.

## 5. Proposed Alternative and Basis for Use

The functional requirement of a vacuum relief valve is only relevant in the opening direction. The closure function is generally irrelevant or passive – the valve remains closed to maintain the system boundary (e.g. loss of system inventory). For these subject valves, there is not a concern for premature opening since during normal operations the valves are closed with system pressure tending to maintain the valve closed.

Therefore, Wolf Creek Nuclear Operating Corporation (WCNOC) will establish a set point range such that the lower limits for opening of the valves will allow considerable margin without affecting the valve's performance with respect to the system requirements. The instrument accuracy and target setpoint for these valves will be established such that the overall combined accuracy specified in the test procedures will limit the actual set pressure to 1% above the stamped set pressure.

Using the provisions of this relief request as an alternative to the specific requirements of Appendix I, 1410, as identified above, will provide adequate assurance of valve set pressure performance with respect to system functional requirements. Therefore, pursuant to 10 CFR 50.55a(z)(1) we request relief from the specific Appendix I requirements identified in this request.

## 6. Duration of Proposed Alternative

This proposed alternative will be utilized for the entire 4$^{th}$ 120 month interval which will begin September 4, 2015 and conclude on September 3, 2025.

## 7. Precedents

Wolf Creek Generating Station – Safety Evaluation – Relief Requests for the Third 10-Year Pump and Valve Inservice Testing Program (TAC Nos. MC8210, MC8212, MD0383, and MD0384) 3/21/2006

## ATTACHMENT 6

## COLD SHUTDOWN JUSTIFICATION INDEX

| Cold Shutdown Justification No. | Description |
|---|---|
| CSJ-01 | Main Steam Isolation Valves (ABHV0011,14,17,20) |
| CSJ-02 | Steam Generator Feedwater Isolation Valves (AEFV0039,40,41,42) |
| CSJ-03 | Not Used |
| CSJ-04 | Auxiliary Feedwater to SG Check Valves (AEV0124,125,126,127) |
| CSJ-05 | Auxiliary Feedwater Pump Discharge Check Valves (ALV0030,33,36,42,45,48) |
| CSJ-06 | Not Used |
| CSJ-07 | Pressurizer Power Operated Relief Valves (BBPCV0455A/456A) |
| CSJ-08 | Not Used |
| CSJ-09 | Not Used |
| CSJ-10 | Letdown System Isolation Valves (BGHV8152/8160) |
| CSJ-11 | RCS Letdown to Regenerative HX Isolation Valves (BGLCV0459/460) |
| CSJ-12 | Boric Acid Pumps Discharge Check Valve (BGV0174) |
| CSJ-13 | SI Accumulator Vent Valves (EPHV8950A,B,C,D,E,F) |
| CSJ-14 | Not Used |
| CSJ-15 | SG Feedwater Regulating Valves (AEFCV0510,520,530,540) |

## ATTACHMENT 7

## COLD SHUTDOWN JUSTIFICATIONS

**Cold Shutdown Justification CSJ-01**

| Valve Number | System | Class | Category |
|---|---|---|---|
| ABHV0011 | AB | 2 | B |
| ABHV0014 | AB | 2 | B |
| ABHV0017 | AB | 2 | B |
| ABHV0020 | AB | 2 | B |

**Function**

These normally open, hydraulically operated valves must close to isolate the Steam Generators from the non-safety related portion of the Main Steam header. These valves are not considered a containment isolation valves for Penetration P-1/2/3/4. These valves are a secondary system barrier since the Steam Generators are closed loop inside containment. Therefore, these valves are exempt from Appendix J Type C leakage testing. These valves are required to close in the event of a Main Steam Line Break or Steam Generator Tube Rupture. These valves are required to close within 5 seconds in response to a steam line isolation signal (SLIS). A SLIS is automatically generated due to: 1) high steam line negative pressure rate, 2) high containment pressure, 3) low steam line pressure.

These valves are open during normal operation to provide a flow path from the Steam Generator to the main steam power conversion system. The open function does not support safe shutdown or accident mitigation.

**Justification**

It is impracticable to exercise these valves closed during normal power operations since exercising these valves may result in a plant transient and subsequent reactor trip.

Closing these valves for testing during normal power operations would interrupt steam flow from the Steam Generator to the main steam/turbine systems and result in a severe transient. Testing by isolating each main steam header is also possible but would cause a power reduction, which is also unacceptable from an operational viewpoint. Partial stroke exercising these valves is also impracticable since even a part-stroke exercise increases the risk of a valve closure when the unit is generating power.

**Alternative Test**

These valves will be exercised closed during cold shutdowns when the main steam system is not required to be operational.

**Cold Shutdown Justification CSJ-02**

| Valve Number | System | Class | Category |
|---|---|---|---|
| AEFV0039 | AE | 2 | B |
| AEFV0040 | AE | 2 | B |
| AEFV0041 | AE | 2 | B |
| AEFV0042 | AE | 2 | B |

**Function**

These normally open hydraulically operated valve must close automatically on a Feedwater Isolation Signal (FWIS) during accident conditions requiring feedwater isolation. A FWIS is generated by either a Safety Injection signal, high-high level in any Steam Generator, low-low level in any Steam Generator, or a reactor trip coincident with reactor coolant low average temperature. These valves are required to close within 5 seconds upon receipt of an isolation signal to isolate a faulted Steam Generator or to prevent diversion of Auxiliary Feedwater flow away from the Steam Generator. These valves may also be operated by remote manual operations. The containment penetrations associated with the Steam Generators are not subject to GDC-57, since the containment barrier integrity is not breached. These valves fail closed on loss of hydraulic supply or electrical power.

These valves open to provide feedwater flow from the feedwater system to the Steam Generators during normal power operation. This function is not required for safe shutdown or accident mitigation since the supply of normal feedwater is not safety related.

**Justification**

It is impracticable to exercise these valves closed during normal power operations since exercising these valves may result in a plant transient and subsequent reactor trip.

Exercising these valves closed during normal power operations requires isolating normal feedwater flow to the Steam Generators. This testing could result in a severe transient (i.e. level) in the associated Steam Generator and subsequent trip to the reactor. Partial stroke exercising these valves is also impracticable since even a part-stroke exercise increases the risk of a valve closure when the unit is generating power.

**Alternative Test**

These valves will be exercised closed and fail safe tested during cold shutdowns when the Steam Generators and feedwater system are not required to be in service.

## Cold Shutdown Justification CSJ-03

**Not Used**

**Cold Shutdown Justification CSJ-04**

| Valve Number | System | Class | Category |
|---|---|---|---|
| AEV0124 | AE | 2 | C |
| AEV0125 | AE | 2 | C |
| AEV0126 | AE | 2 | C |
| AEV0127 | AE | 2 | C |

## Function

These check valves must open to provide a flow path from the Auxiliary Feedwater (AFW) pumps to the Steam Generators during accident conditions requiring Auxiliary Feedwater system initiation. These valves must open to provide a minimum flow of 250 gpm during Auxiliary Feedwater operation.

These valves must close to prevent steam binding of the Auxiliary Feedwater pumps. These valves are not considered a containment isolation valves. The containment penetrations associated with the Steam Generators are not subject to GDC-57, since the containment barrier integrity is not breached. These valves are closed during normal power operation to isolate AFW such that the normal feedwater system flow is routed to the Steam Generators.

## Justification

It is undesirable to exercise these valves open or closed during normal power operations since exercising these valves would result in establishing a cold water flow to the Steam Generators.

The introduction of cold water into the system during normal operation would result in subjecting the Steam generator feed water nozzles to an unnecessary, and possibility detrimental thermal shock, which could result in system pressure boundary failure.

## Alternative Test

These valves will be exercised open and closed during cold shutdowns when the Steam Generators are not required to be in service.

**Cold Shutdown Justification CSJ-05**

| Valve Number | System | Class | Category |
|---|---|---|---|
| ALV0030 | AL | 3 | C |
| ALV0033 | AL | 2 | C |
| ALV0036 | AL | 2 | C |
| ALV0042 | AL | 3 | C |
| ALV0045 | AL | 2 | C |
| ALV0048 | AL | 2 | C |

## Function

These check valves must open to provide a flow path from the Auxiliary Feedwater pump discharge to the Steam Generators for emergency cool down of the Reactor Coolant System. This function ensures that the Auxiliary Feedwater pumps maintain sufficient water level in the Steam Generators to ensure adequate heat transfer and continuation of the decay heat removal process.

These check valves closes to prevent diversion of flow through an idle Auxiliary Feedwater pump to ensure adequate flow is delivered to the Steam Generators by the operating pumps. This function is not required for safe shutdown or accident mitigation since downstream isolation valves isolate the AFW pump discharge piping from the opposite pumps. These valves remain closed and do not open unless the associated Auxiliary Feedwater pump is started. Therefore backflow through an idle pump discharge check valve is not credible.

## Justification

It is impracticable to exercise these valves open or closed during normal power operations since exercising these valves would result in establishing cold water flow to the Steam Generators.

Exercising these valves open during normal power operations requires injection of cold water into the Steam Generators to verify the open full flow position of the valves. This type of test places the plant in an undesirable condition since flow through these valves would unnecessarily thermally shock the Steam Generator feedwater nozzles. Since the closure testing of these valves can only be performed during the open testing, it is also impracticable to test these valves closed during normal power operations.

## Alternative Test

These valves will be exercised open and closed during cold shutdowns when the Steam Generators are not required to be in service.

## Cold Shutdown Justification CSJ-06

**Not Used**

**Cold Shutdown Justification CSJ-07**

| Valve Number | System | Class | Category |
|---|---|---|---|
| BBPCV0455A | BB | 1 | B |
| BBPCV0456A | BB | 1 | B |

**Function**

These normally closed solenoid operated valves are Pressurizer Power Operated Relief Valves (PORV), which open to provide a flow path from the pressurizer to the pressurizer relief tank to reduce Reactor Coolant System (RCS) pressure during low temperature operation. These two PORV's are supplied with actuation logic to ensure that a redundant and independent RCS pressure control back-up feature is provided for the operator during low temperature operations. The logic system continuously monitors RCS temperature and pressure whenever plant conditions are at low temperatures. These valves are not required upon to prevent over-pressurization of the Reactor Coolant System, that function is performed by the pressurizer safety valves. These PORV's do however function to relieve system pressure to limit the undesirable opening of the Pressurizer Safety Valves. These PORV's are also relied upon for depressurizing the RCS to cold shutdown. These valves are set to open automatically at 2335 psig.

These valves must also be able to close to maintain the Reactor Coolant System pressure and prevent loss of RCS inventory via the pressurizer relief tank. These valves close automatically when pressurizer pressure is below 2185 psig. These valves fail closed upon loss of electrical power.

**Justification**

It is impracticable to full or partial stroke exercise these valves open and closed during normal power operations since exercising these valves would result in an RCS pressure transient and subsequent reactor trip.

Exercising these valves open and closed during normal power operations would result in a rapid depressurization of the Reactor Coolant System which would cause a pressure transient and subsequent trip of the reactor. Additionally, exercising these valves quarterly at power would eventually lead to unnecessary valve seat damage.

**Alternative Test**

These valves will be exercised open, closed, and fail safe tested during cold shutdowns when the Reactor Coolant System is depressurized.

## Cold Shutdown Justification CSJ-08

**Not Used**

## Cold Shutdown Justification CSJ-09

**Not Used**

**Cold Shutdown Justification CSJ-10**

| Valve Number | System | Class | Category |
|---|---|---|---|
| BGHV8152 | BG | 2 | A |
| BGHV8160 | BG | 2 | A |

**Function**

These normally open air operated valves must close upon receipt of a Phase A containment isolation signal to isolate containment from the chemical and volume control system. These valves are classified as containment isolation valves. These valves also fail closed upon loss of air or electrical power.

These valves are normally open to provide a letdown flow path from the letdown orifice header to the letdown heat exchanger. This function is not required for safe shutdown or accident mitigation.

**Justification**

It is impracticable to full or partial stroke exercise these valves closed during normal power operations since closing these valves places the plant in an undesirable condition, since failure may cause a loss of pressurizer level control and subsequent trip of the reactor.

**Alternative Test**

These valves will be exercised closed and fail safe tested during cold shutdowns when the Reactor Coolant System is depressurized.

## Cold Shutdown Justification CSJ-11

| Valve Number | System | Class | Category |
|---|---|---|---|
| BGLCV0459 | BG | 1 | B |
| BGLCV0460 | BG | 1 | B |

### Function

These normally open air operated valves must close automatically upon receipt of a pressurizer low level signal to isolate the letdown line and regenerative heat exchanger from the Reactor Coolant System thus preventing further loss of reactor coolant. These valves are interlocked such that they cannot be opened if any orifice valves (i.e. BGHV8149A, B, or C) are open. These valves also fail closed upon loss of air or electrical power.

These valves open to provide a letdown flow path from the Reactor Coolant System to the regenerative heat exchanger during normal power operation. This function is not required for safe shutdown or accident mitigation.

### Justification

It is impracticable to full or partial stroke exercise these valves closed during normal power operations since closure would isolate the normal letdown flow path which places the plant in an undesirable condition.

Closure of these valves at power may cause a voiding effect which could lead to water hammer. Additionally, closure of these valves during normal power operation could adversely affect pressurizer level control and result in a trip of the reactor.

### Alternative Test

These valves will be exercised closed and fail safe tested during cold shutdowns when the normal Reactor Coolant System letdown flow path is not required.

**Cold Shutdown Justification CSJ-12**

| Valve Number | System | Class | Category |
|---|---|---|---|
| BGV0174 | BG | 3 | C |

**Function**

This check valve must open to provide a flow path from the discharge of the boric acid transfer pumps to the charging pump suction header when emergency boration is required. This check valve must open to provide 30 gpm.

This valve must also close to prevent suction flow from either the RHR Heat Exchanger discharge or Refueling Water Storage Tank (RWST) from being diverted from the suction of the Centrifugal Charging Pumps. The closing of this valve will ensure that these other charging pump suction sources will be diverted to the Centrifugal Charging Pumps, which is required during accident conditions.

**Justification**

It is impracticable to exercise this valve open during normal power operations as in doing so would result in the injection of a substantial amount of boron into the Reactor Coolant System in order to verify full flow. Boration of the Reactor Coolant System to perform this test would cause a power transient due to the negative reactivity addition and could result in a trip of the reactor.

**Alternative Test**

This valve will be exercised open and closed during cold shutdowns when the chemical and volume control and Reactor Coolant Systems are not required.

**Cold Shutdown Justification CSJ-13**

| Valve Number | System | Class | Category |
|---|---|---|---|
| EPHV8950A | EP | 2 | B |
| EPHV8950B | EP | 2 | B |
| EPHV8950C | EP | 2 | B |
| EPHV8950D | EP | 2 | B |
| EPHV8950E | EP | 2 | B |
| EPHV8950F | EP | 2 | B |

## Function

These normally closed solenoid operated valves must open to provide a flow path from the safety injection accumulator to atmosphere. This function is required to depressurize the safety injection accumulator tank during emergency shutdown conditions, since the accumulator tank outlet valves (EPHV8808A-D) cannot be closed. This function prevents the injection of accumulator water to the RCS as well as preventing the injection of nitrogen in to the RCS. Closure of these valves, once opened, would not be required to support any accident analysis.

These valves are initially closed and are required to remain closed in order to isolate the safety injection accumulator tank vent to containment atmosphere, thereby assuring sufficient pressure within the accumulator for injection purposes. Since this valve is not required to change positions to perform this function, it is considered passive in the closed position. Additionally, the accumulator level and pressure is continuously monitored and alarmed in the control room. If excessive leakage is detected, Operator Action would then be required to maintain the plants operation within the requirements of Technical Specifications or to bring the plant to a safe shutdown condition. These valves fail closed upon loss of electrical power.

## Justification

It is impracticable to full or partial stroke exercise these valves open during normal power operations since exercising these valves places the plant in an undesirable configuration, rendering the respective safety injection accumulator inoperable. The Technical Specification action statement may not allow adequate time to test the valves and restore the accumulator. Additionally, should one of the valves fail to close, insufficient time is allowed to repair/replace/retest prior to shutting down the plant.

## Alternative Test

These valves will be exercised open and closed and fail safe tested during cold shutdowns when the safety injection accumulators are not required to be in service.

## Cold Shutdown Justification CSJ-14

**Not Used**

**Cold Shutdown Justification CSJ-15**

| Valve Number | System | Class | Category |
|---|---|---|---|
| AEFCV0510 | AE | 3 | B |
| AEFCV0520 | AE | 3 | B |
| AEFCV0530 | AE | 3 | B |
| AEFCV0540 | AE | 3 | B |

## Function

These normally open air operated feedwater regulating valves must close automatically on a Feedwater Isolation Signal (FWIS) during accident conditions. A FWIS is generated by either a Safety Injection signal, high-high level in any Steam Generator, low-low level in any Steam Generator, or a reactor trip coincident with reactor coolant low average temperature. In the event of a secondary cycle pipe rupture inside containment, the main feedwater control valves (and associated bypass valves) provide a diverse backup to the MFIV to limit the quantity of high energy fluid that enters the containment through the broken loop. These valves fail closed on loss of hydraulic supply or electrical power.

These regulating valves open to provide feedwater flow from the feedwater system to the Steam Generators during normal power operation. This function is not required for safe shutdown or accident mitigation since the supply of normal feedwater is not safety related.

## Justification

It is impracticable to exercise these valves closed during normal power operations since exercising these valves may result in a plant transient and subsequent reactor trip.

Exercising the regulating valves (AEFCV0510-0540) closed during normal power operations requires isolating normal feedwater flow to the Steam Generators. This testing could result in a severe transient (i.e. level) in the associated Steam Generator and subsequent trip or the reactor. Partial stroke exercising these valves is also impracticable since even a part-stroke exercise increases the risk of a valve closure when the unit is generating power.

## Alternative Test

These valves will be exercised closed and fail safe tested during cold shutdowns when the Steam Generators and feedwater system are not required to be in service.

## ATTACHMENT 8

## REFUELING OUTAGE JUSTIFICATION INDEX

| Refueling Outage Justification No. | Description |
|---|---|
| RJ-01 | SIS Boron Injection Tank to RCS Check Valves (BBV0001,22,40,59) |
| RJ-02 | Normal/Alternate Charging to RCS Check Valves (BB8378A/B,8379A/B) |
| RJ-03 | Volume Control Tank Outlet Check Valve (BG8440) |
| RJ-04 | Centrifugal Charging Pumps Discharge Check Valves (BG8481A,B) |
| RJ-05 | RWST to Charging Pump Suction Check Valves (BG8546A,B) |
| RJ-06 | Containment Recirc Sump Isolation Valves (EJHV8811A,B) |
| RJ-07 | Boron Injection Tank to RCS Cold Leg Injection Check Valve (EM8815) |
| RJ-08 | Safety Injection Pump Discharge Check Valves (EM8922A,B) |
| RJ-09 | ESW Water Hammer Vacuum Relief Valves (EFV0476, 478, 482, 484) |
| RJ-10 | Reactor Vessel Head Vent Valves (BBHV8001A/B,8002A/B) |
| RJ-11 | RCP Seal Injection Check Valves (BV0120,121,150,151,180,181,210,211) |
| RJ-12 | CCW to RCP Thermal Barrier Check Valves (BBV0443, 444, 445, 446,447, 448,449, 450) |
| RJ-13 | Reactor Building Instrument Air Isolation Valve (KAFV0029) |

## ATTACHMENT 9

## REFUELING OUTAGE JUSTIFICATIONS

**Refueling Outage Justification RJ-01**

| Valve Number | System | Class | Category |
|---|---|---|---|
| BBV0001 | BB | 1 | A/C |
| BBV0022 | BB | 1 | A/C |
| BBV0040 | BB | 1 | A/C |
| BBV0059 | BB | 1 | A/C |

**Function**

These check valves must open to provide a flow path from the charging pumps via the boron injection tank to the reactor coolant system when safety injection is initiated by a SIS.

These valves must close or remain closed to isolate the Reactor Coolant System from the Boron Injection Tank. These check valves are considered as pressure isolation valves, required to maintain the RCS pressure boundary.

**Justification**

It is impracticable to exercise these valves open and closed during normal power operations or cold shutdowns since exercising these valves requires injection of borated water into the RCS and would cause a plant transient and subsequent reactor trip.

Exercising these valves open and closed during normal power operations or during cold shutdowns would require injection of borated water by the Centrifugal Charging Pump into the RCS. The increase boration would cause a power decrease and thermal transient to the Reactor Coolant piping.

**Alternative Test**

These valves will be exercised open and closed during refueling outages when the Reactor Coolant System is not required to be in service.

**Refueling Outage Justification RJ-02**

| Valve Number | System | Class | Category |
|---|---|---|---|
| BB8378A | BB | 1 | C |
| BB8378B | BB | 1 | C |
| BB8379A | BB | 1 | C |
| BB8379B | BB | 1 | C |

**Function**

These check valves must close to isolate the Reactor Coolant System from the lower pressure charging system in the event of a pipe break in the CVCS system.

Valves BB8378A/B open to provide a flow path for normal charging flow from the Centrifugal Charging Pumps to the RCS. Valves BBV8379A/B open to provide a flow path for alternate charging flow from the Centrifugal Charging Pumps to the RCS. The normal charging flow path maintains the required water inventory in the RCS during normal operation, power changes, startup, and shutdown. The alternate charging provides backup to the normal charging flow path. These flow paths are also identified as emergency boration flow paths. These flow paths provide a diverse means of borating the RCS to a concentration that exceeds the requirement for safe shutdown of the reactor from any operating condition, assuming that the control rod cluster with the highest reactivity worth is stuck in its fully withdrawn position and the unlikely event that safe shutdown is initiated from peak xenon conditions (USAR 9.3.4.1.1/SDB Eight).

**Justification**

It is impracticable to exercise these check valves closed during normal power operations or cold shutdown since interrupting charging flow to the RCS places the plant in an undesirable configuration. Access to these valves requires entry behind the reactor bioshield wall inside containment, which is not practicable from a radiation exposure standpoint during normal plant operations and is not practical during cold shutdowns when the area is highly radioactive and the valve body is insulated at a temperature that exceeds non-intrusive equipment adhesive ratings.

**Alternative Test**

These valves will be exercised open and closed during refueling outages when the Charging System is not required and radiation levels permit entry into the containment area that needs to be accessed for testing.

**Refueling Outage Justification RJ-03**

| Valve Number | System | Class | Category |
|---|---|---|---|
| BG8440 | BG | 2 | C |

**Function**

This check valve must open during the injection mode of ECCS to provide a minimum flow recirculation flow path through the Seal Water Heat Exchanger to protect the Centrifugal Charging Pumps while they are in recirculation operation. The valve must open to provide a minimum 120 gpm (2 pumps @ 60 gpm each) for recirculation. This mode of operation will occur when the RWST is still the suction source and a safety injection signal is present.

Additionally, this check valve opens to provide a flow path from the volume control tank to the charging pump suction during normal plant operations. This function is not required for safe shutdown or accident mitigation.

This valve must close to prevent backflow and isolate the seal water heat exchanger piping during recirculation modes of ECCS. Valves BGLCV112B/C close to isolate the volume control tank and check valves BG8546A/B close to isolate the refueling water storage tank during hot and cold recirculation modes of ECCS while the Centrifugal Charging Pumps are supplied by the residual heat removal pumps. BG8440 must close to prevent diversion of the residual heat removal flow and potentially lifting the seal water heat exchanger relief valve BG8123.

**Justification**

It is impracticable to exercise this valve closed during normal power operation or during cold shutdowns. Exercising the valve requires the performance of a leakage or reverse flow test to verify the closed position.

To perform a leakage test or reverse flow test to verify closure during normal operations or during cold shutdowns requires temporary test equipment to be installed to establish a differential pressure across the valve to verify closure. This test is impracticable to be performed during normal power operations or during cold shutdowns since the charging and residual heat removal systems would be required to be drained/vented and out of service to perform a leakage test.

**Alternative Test**

This valve will be exercised closed during refueling outages when the BG and EJ systems are not required to be in service. The open direction function of this valve is verified using normal system flow during normal power operations.

**Refueling Outage Justification RJ-04**

| Valve Number | System | Class | Category |
|---|---|---|---|
| BG8481A | BG | 2 | C |
| BG8481B | BG | 2 | C |

## Function

These check valves must open to provide a flow path from the Centrifugal Charging Pumps to the Reactor Coolant System cold legs during injection and to the Reactor Coolant System hot or cold legs during the recirculation mode of ECCS operation. These valves must open to provide 538 gpm each to the Reactor Coolant System during injection and recirculation modes.

The valves must close to prevent backflow through an idle pump during ECCS injection and recirculation modes of operation. Closure of the valves ensure adequate flow to the Reactor Coolant System in the event of a failure of the respective Centrifugal Charging Pump to start.

## Justification

It is impracticable to exercise these check valves open during normal power operations or cold shutdowns since injection into the Reactor Coolant System during normal operations or cold shutdowns would cause a plant transient and potential trip of the reactor.

Exercising these valves open requires injection of borated water into the Reactor Coolant System. Performance of this test during normal plant operations would cause an increase in the reactor coolant boron inventory resulting in a potential trip of the reactor. Performing this test during cold shutdowns may result in a cold over- pressurization of the Reactor Coolant System.

## Alternative Test

These valves will be exercised opened and closed during refueling outages when the Reactor Coolant System is not required to be in service.

**Refueling Outage Justification RJ-05**

| Valve Number | System | Class | Category |
|---|---|---|---|
| BG8546A | BG | 2 | C |
| BG8546B | BG | 2 | C |

## Function

These check valves must open to provide a flow path from the refueling water storage tank to the charging pump suction during the injection mode of ECCS [USAR 6.3.2.1/6.3.2.2]. These valves must also open to provide a flow path from the refueling water storage tank to the Centrifugal Charging Pumps for automatic makeup to the Reactor Coolant System in the event of a minor leak when valves BNLCV0112D/E open automatically upon receipt of a volume control tank Low-Low Level signal. The valves must open to provide 419 gpm to the charging pump suction during the injection mode.

These valves must also close to prevent back flow of the residual heat removal pumps discharge to the refueling water storage tank during the recirculation phase of ECCS operation. Closure of the valves ensure an adequate suction source for the charging and safety injection pumps.

## Justification

It is impracticable to exercise these check valves open during normal power operations or cold shutdowns since doing so would result in the injection of borated water into the Reactor Coolant System. Performance of this test during normal plant operations would cause an increase in the reactor coolant boron inventory resulting in a potential trip of the reactor. Performing this test during cold shutdowns may result in a low temperature over- pressurization of the Reactor Coolant System.

## Alternative Test

These valves will be exercised opened and closed during refueling outages when the Reactor Coolant System is not required to be in service.

**Refueling Outage Justification RJ-06**

| Valve Number | System | Class | Category |
|---|---|---|---|
| EJHV8811A | EJ | 2 | B |
| EJHV8811B | EJ | 2 | B |

**Function**

These normally closed motor operated valves must open to provide a flow path from the Containment Recirculation Sump to the suction of the RHR Pump when the Emergency Core Cooling System (ECCS) shifts from Injection to Recirculation modes. These valves open automatically when two of the 4 level transmitters on the RWST indicate a low-low-1 level in conjunction with a Safety Injection Signal. The opening of these valves function to support the safe shutdown and accident mitigation by providing a recirculation flow path from the Containment Sump when the RWST is exhausted following the Injection mode.

These valves are considered to be Containment Isolation valves for Penetration P-14/15 and may be closed by remote manual operation to isolate Containment and the Containment Recirculation Sumps from the Residual Heat Removal System. These valves do not receive an automatic Containment Isolation signal since they must remain open during the Recirculation mode of ECCS. These valves are exempt from Appendix J Type C testing due to a closed system outside containment. During normal operations these valves are interlocked such that they cannot be opened unless the RHR suction valves from both the RWST and RCS are closed. Since the valves are not required to change positions to perform the closed function, they are considered passive in the closed position [ISTC-2000]. Once open, these valves are not required to close again to support any accident analysis.

These valves are included in the WCNOC OMN-1 Program.

**Justification**

It is impracticable to exercise these valves open or closed (full or partial) during normal power operations since opening the valves places the plant in an undesirable configuration.

Exercising these valves open and closed during normal power operations places the plant in an undesirable configuration since opening these valves requires defeating the interlocks on the RHR suction isolation valves from the RWST and RCS. This test would require placing both trains of RHR in an inoperable status.

**Alternative Test**

These valves will be exercised open/closed during refueling outages when RHR is not required and the suction isolation valves from the RWST and RCS may be opened.

**Refueling Outage Justification RJ-07**

| Valve Number | System | Class | Category |
|---|---|---|---|
| EM8815 | EM | 1 | A/C |

## Function

This check valve must open to provide a flow path from the Centrifugal Charging Pumps to the Reactor Coolant System cold legs during injection and recirculation modes of ECCS. This check valve must open to provide a minimum flow of 460 gpm.

This check valve must close to isolate containment from the chemical and volume control system. This valve is considered a containment isolation valve for penetration P-88 however it is exempt from Appendix J Type C leakage testing due to a closed system outside containment. This valve is also considered a Pressure Isolation Valve and must close to isolate the Reactor Coolant System from the chemical and volume control system.

## Justification

It is impracticable to exercise this valve open or closed during normal power operations or cold shutdowns since exercising the valve requires injection by the Centrifugal Charging Pumps into the RCS to verify full flow. This test cannot be performed during power operations since injection of borated water into the RCS cold legs would result in a decrease in reactor power resulting in a power transient and subsequent reactor trip. Additionally, injection during power operations would thermally shock the Reactor Coolant System piping. During cold shutdown this valve cannot be exercised since injection into the RCS could result in low temperature over-pressurization of the Reactor Coolant System.

## Alternative Test

This valve will be exercised open and closed during refueling outages when the Reactor Coolant System is depressurized and injection by the Centrifugal Charging Pumps into the RCS is possible.

**Refueling Outage Justification RJ-08**

| Valve Number | System | Class | Category |
|---|---|---|---|
| EM8922A | EM | 2 | C |
| EM8922B | EM | 2 | C |

**Function**

These check valves must open to provide a flow path from the safety injection pump to the Reactor Coolant System during ECCS injection and recirculation modes of operation.

These valves must close to prevent backflow through an idle pump during ECCS injection and recirculation modes of operation. Closure of these valves ensures adequate flow to the Reactor Coolant System in the event of a failure of the respective safety injection pump to start.

**Justification**

It is impracticable to exercise these valves open or closed during normal power operations or cold shutdowns since exercising the valves requires injection by the safety injection pumps into the RCS to verify full flow. This test cannot be performed during power operations since the safety injection pump cannot overcome Reactor Coolant System pressure. During cold shutdown these valves cannot be exercised since injection into the RCS could result in low temperature over-pressurization of the Reactor Coolant System.

**Alternative Test**

These valves will be exercised open and closed during refueling outages when the Reactor Coolant System is depressurized and injection by the safety injection pumps into the RCS is possible.

**Refueling Outage Justification RJ-09**

| Valve Number | System | Class | Category |
|---|---|---|---|
| EFV0476 | EF | 3 | B |
| EFV0478 | EF | 3 | B |
| EFV0482 | EF | 3 | B |
| EFV0484 | EF | 3 | B |

**Function**

Valves EFV0476, EFV0478, EFV0482, and EFV0484 are normally closed check valves that are being utilized as vacuum breakers/pressure relief devices for the ESW System. These valves are classified as check valves per table ISTC-3500-1 note (4) since they are not capacity certified.

These valves are normally closed to help maintain a continuous water column throughout the ESW System at all points upstream of the Vertical Loop and to maintain the ESW System pressure boundary during system operation. They must open to allow air to enter the ESW Vertical Loop to allow drain down of the downstream piping without pulling a vacuum in the upstream piping thus creating voids in the system during a Loss of Off Site Power (LOOP) event.

**Justification**

It is impracticable to exercise these valves open during normal power operations or cold shutdowns since exercising the valves would require a train of ESW to be taken out of service. Since these valves are in a vacuum breaker configuration, the only way to effectively open test them is to remove from service and bench test.

**Alternative Test**

Two of these valves will be removed from service and exercised open and closed during a bench test every refuel outage to meet the requirements of ISTC-5221(c)(3).

**Refueling Outage Justification RJ-10**

| Valve Number | System | Class | Category |
|---|---|---|---|
| BBHV8001A | BB | 2 | B |
| BBHV8001B | BB | 2 | B |
| BBHV8002A | BB | 2 | B |
| BBHV8002B | BB | 2 | B |

**Function**

These normally closed solenoid operated valves must open to vent the Reactor Vessel Head during post-accident conditions.

The valves must close to maintain the reactor coolant pressure boundary and isolate RCS pressure from the containment atmosphere. These valves fail closed upon loss of power.

**Justification**

It is impracticable to full or partial exercise these valves open and closed during normal power operations since exercising these valves would place the plant in an undesirable configuration along with an increase in personnel radiation exposure to perform testing.

Exercising these valves open and closed during normal power operations would require venting of the Reactor Coolant System directly to containment. During normal power operations this test would result in a potential Loss of Coolant Accident since only one valve would remain to establish the Reactor Coolant System boundary. Stroke testing, if attempted at cold shutdown, could extend the length of plant shutdown due to extensive preparatory work in establishing the proper RCS conditions. Containment entry is required to install the necessary vent test rig to perform this test. This would result in an increase in personnel radiation exposure.

**Alternative Test**

These valves will be exercised open and closed and fail safe tested during refueling outages when the Reactor Coolant System is depressurized and radiation levels permit entry into containment.

**Refueling Outage Justification RJ-11**

| Valve Number | System | Class | Category |
|---|---|---|---|
| BBV0120 | BB | 1 | C |
| BBV0121 | BB | 1 | C |
| BBV0150 | BB | 1 | C |
| BBV0151 | BB | 1 | C |
| BBV0180 | BB | 1 | C |
| BBV0181 | BB | 1 | C |
| BBV0210 | BB | 1 | C |
| BBV0211 | BB | 1 | C |

**Function**

These check valves must open to provide a flow path from CVCS Centrifugal Charging Pumps through the Reactor Coolant Pump (RCP) seals for emergency boration. A portion of the charging flow is directed through the Seal Water Filter and the RCPs to borate the Reactor Coolant System in order to achieve and maintain a safe shutdown. These check valves must open to provide a flow rate of 5 gpm each. Seal water injection also provides cooling and lubrication to the RCP seals, preventing RCP seal damage. This cooling/lubrication water function is not required for safe shutdown or accident mitigation since the reactor coolant pumps are not relied upon for safe shutdown.

These valves must close to isolate the Reactor Coolant System from the charging system thereby maintaining the Reactor Coolant System pressure boundary. These valves are not considered containment isolation valves. The containment isolation function is assigned to a separate upstream check valve and motor operated valve pair.

**Justification**

It is impracticable to exercise these check valves closed during normal power operations since interrupting seal injection flow would damage the reactor coolant pump seals, and ultimately the pumps. Therefore, testing would require removing the associated reactor coolant pump from service.

To verify valve closure requires a backflow/leakage test. This testing requires entry into containment for test alignment and performance. During normal power operations this testing would result in an increase in personnel radiation exposure.

In addition, per NUREG-1482, Rev.2, Section 3.1.1.4, the NRC staff recommends that licensees should test these valves on a refueling outage schedule and during plant outages when the reactor coolant pumps are stopped for a sufficient period of time. The NRC staff has determined that licensees need not schedule valve testing that requires stopping and restarting reactor coolant pumps each cold shutdown solely to allow for testing these valves. This repetitive cycling would increase pump wear and stress, as well as the number of cycles related to plant equipment, and could extend the length of cold shutdown outages.

**Refueling Outage Justification RJ-11**

**(Continued)**

**Alternative Test**

These valves will be exercised closed during refueling outages when the reactor coolant pumps are not required to be in service and radiation levels permit entry into containment.

**Refueling Outage Justification RJ-12**

| Valve Number | System | Class | Category |
|---|---|---|---|
| BBV0443 | BB | 3 | C |
| BBV0444 | BB | 3 | C |
| BBV0445 | BB | 3 | C |
| BBV0446 | BB | 3 | C |
| BBV0447 | BB | 3 | C |
| BBV0448 | BB | 3 | C |
| BBV0449 | BB | 3 | C |
| BBV0450 | BB | 3 | C |

**Function**

These check valves must close to isolate the Reactor Coolant System from the component cooling water system in the event of a cooling coil tube leak, and thus maintaining the reactor coolant pressure boundary.

These valves provide a cooling water supply flow path from the component cooling water system to the RCP thermal barrier cooling coil. This supplied cooling prevents RCP pump damage and degradation of the pump seals. The supply of CCW to the RCP thermal barrier is not required for safe shutdown or accident mitigation since the reactor coolant pumps are not relied upon.

**Justification**

It is impracticable to exercise these check valves closed during normal power operations since closure testing would require interrupting seal injection flow possibly resulting in damage to the reactor coolant pump seals, and ultimately the pump. Therefore, testing would require removing the associated reactor coolant pump from service.

To verify valve closure requires a backflow/leakage test. This testing requires entry into containment for test alignment and performance. During normal power operations this testing would result in an increase in personnel radiation exposure.

In addition, per NUREG-1482, Rev.2, Section 3.1.1.4, the NRC staff recommends that licensees should test these valves on a refueling outage schedule and during plant outages when the reactor coolant pumps are stopped for a sufficient period of time. The NRC staff has determined that licensees need not schedule valve testing that requires stopping and restarting reactor coolant pumps each cold shutdown solely to allow for testing these valves. This repetitive cycling would increase pump wear and stress, as well as the number of cycles related to plant equipment, and could extend the length of cold shutdown outages.

**Alternative Test**

These valves will be exercised closed during refueling outages when the reactor coolant pumps are not required to be in service and radiation levels permit entry into containment.

**Refueling Outage Justification RJ-13**

| Valve Number | System | Class | Category |
|---|---|---|---|
| KAFV0029 | KA | 2 | A |

## Function

This normally open, air operated valve must close to isolate containment from the non-safety related instrument air system. This valve is considered a containment isolation valve for penetration P-30. The valve receives a Phase A Containment Isolation Signal (CIS), and is required to close upon receipt of that signal within 5 seconds.

This valve is normally open during operation to supply instrument air to various air operated valves within the reactor building. This function is not required for safe shutdown or accident mitigation.

## Justification

Exercising this valve closed during normal power operations would interrupt the instrument air supply to the valves and equipment necessary for system control and operation. Closure of the valve would affect the normal letdown flow path and isolation of the pressurizer spray feature.

Likewise, exercising this valve to the closed position during cold shutdowns would interrupt the actuating air supply to components necessary for system control when maintaining a cold shutdown condition. Interrupting the actuating air supply may cause the valves and components to fail in a non-conservative position.

## Alternative Test

This valve will be exercised closed and fail safe tested during refueling outages when the instrument air system is not required by important plant components.

## ATTACHMENT 10

## CHECK VALVE CONDITION MONITORING PLANS BASIS INDEX

| CVCM No. | Description |
|---|---|
| CVCM-01 | RHR to SI Accumulator Injection Check Valves EP8818A/B/C/D |
| CVCM-02 | Appendix J Option B Check Valves BBV0118/0148/0178/0208, BGV0135, BG8381, EGV0204, KAV0204 |
| CVCM-03 | RHR Heat Exchanger Outlet Check Valves EJ8730A/B |
| CVCM-04 | RHR to SI Hot Leg Recirculation Outlet Check Valves BB8949A/B/C/D |
| CVCM-05 | Safety Injection Pump Suction Check Valves EM8926A/B |
| CVCM-06 | Safety Injection to Accumulator Line Injection Check Valves EPV0010/20/30/40 |
| CVCM-07 | Residual Heat Removal Pump Suction Check Valves EJ8958A/B |
| CVCM-08 | RHR Charging/Safety Injection Pumps Check Valves EJ8969A/B |
| CVCM-09 | Accumulator Tank Discharge Check Valves EP8956A/B/C/D |
| CVCM-10 | Charging to Seal Injection Check Valve BGV0591 |
| CVCM-11 | Auxiliary Feedwater Check Valves ALV0001/54/57/62/67/72/161 FCV0001/2/24/25 |
| CVCM-12 | Post-Accident Sampling Return Check Valves GSV0054/59 |
| CVCM-13 | Safety Injection to RCS Hot Leg Check Valves EMV0001/2/3/4 |
| CVCM-14 | Safety Injection Accumulator Loop Check Valves BB8948A/B/C/D |
| CVCM-15 | Residual Heat Removal to Safety Injection System Check Valves EJ8841A/B |

## ATTACHMENT 11

## CHECK VALVE CONDITION MONITORING PLANS BASIS

## Check Valve Condition Monitoring Plan Basis CVCM-01

| Valve Number | System | Class | Category |
|---|---|---|---|
| EP8818A | EP | 1 | A/C |
| EP8818B | EP | 1 | A/C |
| EP8818C | EP | 1 | A/C |
| EP8818D | EP | 1 | A/C |

### Function

These check valves must open to provide a flow path from the RHR pumps to the Reactor Coolant System cold legs during the injection phase of an accident [USAR 6.3.2]. During the injection phase, these check valves must open to provide a flow rate of 961 gpm each. Additionally, these check valves must open to provide a flow path from the residual heat removal system to the RCS during the cold leg recirculation phase of an accident [USAR 6.3.2].

These check valves must close to isolate the Reactor Coolant System from the lower pressure RHR system. These valves are considered pressure isolation valves, required to maintain the RCS pressure boundary [ITS 3.4.14, B 3.4.14]. The valves are also considered containment isolation valves however they are exempt from Appendix J Type C leakage testing due to a closed system outside containment [USAR Figure 6.2.4-1]. These valves must also close during cold leg recirculation to prevent reverse flow when the SI pumps are required to deliver recirculated water to the cold legs [USAR 6.3.2].

### Justification

In accordance with ASME OM Code Appendix II, these valves are included in the station Check Valve Condition Monitoring Program. The following describes the basis for grouping these valves, failure analysis, 'maintenance and testing history', and planned condition monitoring activities. This plan is written to meet the requirements of Appendix II of the ASME OM Code 2004 Edition.

The intended purpose of the condition monitoring activities for the subject valves is the optimization of testing, examination, and preventive maintenance activities. An analysis of the test and maintenance history has determined that the grouping of these valves is justified. These check valves have the same design characteristics, are installed in the same application, and experience similar service conditions.

### Analysis Reference

For the Condition Monitoring analysis and justification details for this group of valves, refer to WCOP-02 Program Plan Change 109. This change package documents the analysis performed to determine the groupings, specify inservice testing and preventive maintenance activities, and identify activity intervals and attributes for trending. Change 109 also documents the maintenance history and industry review along with the failure modes expected for this valve group.

**Check Valve Condition Monitoring Plan Basis CVCM-01**
**(Continued)**

**Condition Monitoring Activities**

The information in this section satisfies the requirements of ASME OM Code-2004, Appendix II, section II-4000(b), Optimization of Condition Monitoring Activities. The Technical Specification leakage test strategy is proven in industry to be very effective in identifying the credible failure mode of excessive seat leakage. The following details the condition monitoring activities and their implementation frequencies associated with valve group CVCM-01:

| ASSESSMENT TECHNIQUES: | TREND PARAMETER AND FREQUENCY |
|---|---|
| LEAK RATE TESTING | Leak rate data trend - documented once for each cycle. |
| FLOW TESTING | Normal system operation, in-service operator walk-downs - documented once for each cycle |
| MONITORING SYSTEM PRESSURE | Monitoring the RHR system pressure and the number of times during a fuel cycle the operators vent the RHR system - system health reports evaluate quarterly, documented once for each cycle |
| VISUAL - GASKET | Boron crystallization or leaks - walk-downs performed every outage for RCS Category 1 pressure boundary req's. - documented once for each cycle |
| HOURS OF OPERATION | Hours and flow can be estimated to assess bearing block or hinge pin wear - documented once for each cycle |
| UT RESULTS | Min wall, valve body wear rate - evaluation and actions determined by Flow Accelerated Corrosion (FAC) program |

In accordance with ASME OM Code ISTC-5222, if for any reason the condition monitoring plans for this group of valves is discontinued, then the testing or examination requirements of paragraphs, ISTC-3510, ISTC-3520, ISTC-3530, ISTC-3550, and ISTC-5221 shall apply to the applicable valve(s).

**Compliance**

This plan meets the documentation requirements of Appendix II of the ASME OM Code as follows:

a. This Plan Basis documents the valves included in the group for Condition Monitoring

b. WCOP-02 Program Plan Change 109 documents the date and basis for inclusion of these valves in condition monitoring.

c. WCOP-02 Program Plan Change 109 documents the analysis and basis for the check valve condition monitoring program for these valves.

d. WCOP-02 Program Plan Change 109 documents the failure and maintenance history patterns for the subject valves.

e. This Plan Basis and WCOP-02 Program Plan Change 109 document the condition monitoring activities, attributes and bases for the intervals for each of the valves included in this Plan Basis.

## Check Valve Condition Monitoring Plan Basis CVCM-02

| Valve Number | System | Class | Category |
|---|---|---|---|
| BBV0118 | BB | 2 | A/C |
| BBV0148 | BB | 2 | A/C |
| BBV0178 | BB | 2 | A/C |
| BBV0208 | BB | 2 | A/C |
| BGV0135 | BG | 2 | A/C |
| BG8381 | BG | 2 | A/C |
| EGV0204 | EG | 2 | A/C |
| KAV0204 | KA | 2 | A/C |

### Function

BBV0118/0148/0178/0208 (grouped valves)

These check valves must open to provide a flow path from CVCS Centrifugal Charging Pumps to the RCP seals for emergency boration. A portion of the charging flow is directed to the RCPs through a seal water filter, to borate the Reactor Coolant System to achieve and maintain a safe shutdown. These check valves must open to provide a flow rate of 5 gpm each [USAR 9.3.4]. Additionally, these valves open to provide a flow path for RCP seal injection water from CVCS Centrifugal Charging Pumps the RCP seals. This seal injection flow provides cooling in an effort to prevent degradation and damage of the RCP and it's seals. This cooling water function is not required for safe shutdown or accident mitigation since the reactor coolant pumps are not relied upon for safe shutdown.

These valves must close to isolate containment from the CVCS system. These valves are required to provide containment isolation [USAR Figure 6.2.4-1].

BGV0135 (not in a group)

This check valve must close to isolate the containment from the CVCS system. This check valve is a containment isolation valve for penetration P-24.

This check valve must open to provide a flow path from the section of piping that exist between the normally closed inboard and outboard containment isolation valves (BGHV8100/8112) on penetration P-24. When these motor operated containment isolation valves are closed, the water trapped in this isolated section of piping can become pressurized due to heating and subsequent expansion of the water. This check valve opens to provide a flow path upstream of the penetration which allows the pressure and expanding water to routed back to the piping upstream of the inboard isolation valve, therefore preventing pipe damage.

**Check Valve Condition Monitoring Plan Basis CVCM-02**
**(Continued)**

BG8381 (not in a group)

This check valve must close to isolate containment from the normal charging return flow path [USAR 6.3.2]. This valve is considered a containment isolation valve for penetration P-80. [USAR Table 6.2.4-1].

This check valve is open during normal operation to provide a flow path from the Centrifugal Charging Pumps, through the regenerative heat exchanger tubes to recover heat from the letdown flow, then to the Reactor Coolant System. This function is not required for safe shutdown or accident mitigation [USAR 9.3.4].

EGV0204 (not in a group)

This check valve must close to isolate the containment from the Component Cooling Water (CCW) system. This valve is considered a containment isolation valve for penetration P-74 [USAR Figure 6.2.4-1].

This valve opens to provide a flow path from the component cooling water system to the various equipment coolers inside containment during normal plant operating modes and emergency conditions [USAR 9.2.2]. The function of supplying cooling flow to the supported equipment is not required for safe shutdown or accident mitigation.

KAV0204 (not in a group)

This check valve must close to isolate containment from the non-safety related instrument air system. This valve is considered a containment isolation valve for penetration P-30. [USAR Figure 6.2.4-1]

This valve is open during normal operation to supply instrument air to the reactor building primarily for use in the operation of various valves. This function of supplying instrument air to the supported equipment is not required for safe shutdown or accident mitigation.

**Justification**

In accordance with ASME OM Code Appendix II, these valves are included in the station Check Valve Condition Monitoring Program. The following describes the basis for grouping the valves, failure analysis, 'maintenance and testing history', and planned condition monitoring activities. This plan is written to meet the requirements of Appendix II of the ASME OM Code 2004 Edition.

The intended purpose of the condition monitoring activities for the subject valves is the optimization of testing, examination and preventive maintenance activities. An analysis of the test and maintenance history has determined that the grouping of these valves is justified. Valves BBV0118/0148/0178/0208 have the same design characteristics, are installed in the same application, and experience similar service conditions. The other Appendix J valves described in this justification are not in a group, but stand alone.

**Check Valve Condition Monitoring Plan Basis CVCM-02**
**(Continued)**

## Analysis Reference

For the Condition Monitoring analysis and justification details for this group of valves, refer to WCOP-02 Program Plan Change 114. This change package documents the analysis performed to determine the groupings, specify inservice testing and preventive maintenance activities and identify activity intervals and attributes for trending. Change 114 also documents the maintenance history and industry review along with the failure modes expected for these valves.

## Condition Monitoring Activities

The information in this section satisfies the requirements of ASME OM Code-2004, Appendix II, section II-4000(b), Optimization of Condition Monitoring Activities. The Appendix J leakage test strategy is proven in industry to be very effective in identifying the credible failure mode of excessive seat leakage. The following details the condition monitoring activities and their implementation frequencies associated with valve group CVCM-02:

| ASSESSMENT TECHNIQUES: | TREND PARAMETER AND FREQUENCY |
|---|---|
| LEAK RATE TESTING | Leak rate data trend - documented on a frequency in accordance with Appendix J Option B. |
| FLOW TESTING | With the exception of BGV0135,normal system operation satisfies flow testing. BGV0135 will be forward exercised at the Option B frequency. |

In accordance with ASME OM Code ISTC-5222, if for any reason the condition monitoring plans for this group of valves is discontinued, then the testing or examination requirements of paragraphs, ISTC-3510, ISTC-3520, ISTC-3530, ISTC-3550, and ISTC-5221 shall apply to the applicable valve(s).

## Compliance

This plan meets the documentation requirements of Appendix II of the ASME OM Code as follows:

a. This Plan Basis documents the valves included in the group for Condition Monitoring

b. WCOP-02 Program Plan Change 114 documents the date and basis for inclusion of these valves in condition monitoring.

c. WCOP-02 Program Plan Change 114 documents the analysis and basis for the check valve condition monitoring program for these valves.

d. WCOP-02 Program Plan Change 114 documents the failure and maintenance history patterns for the subject valves.

e. This Plan Basis and WCOP-02 Program Plan Change 114 document the condition monitoring activities, attributes and bases for the intervals for each of the valves included in this Plan Basis.

## Check Valve Condition Monitoring Plan Basis CVCM-03

| Valve Number | System | Class | Category |
|---|---|---|---|
| EJ8730A | EJ | 2 | C |
| EJ8730B | EJ | 2 | C |

### Function

These check valves must open to provide a flow path from the Residual Heat Removal (RHR) Pumps to the Reactor Coolant (RCS) System. These valves are located on the discharge header for their associated RHR Pump. Each valve isolates one train of RHR and must open to allow flow during the Injection and Recirculation phases of ECCS [USAR 6.3.2].

These valves must close to prevent diverting Residual Heat Removal flow when the associated pump is secured but the opposite trains pump is running. The RHR System is designed to be a redundant (two train) system. [USAR 5.4.7] Therefore, one train of RHR could be required in an accident while the other train is secured or inoperable

### Justification

In accordance with ASME OM Code Appendix II, these valves are included in the station Check Valve Condition Monitoring Program. The following describes the basis for grouping the valves, failure analysis, maintenance/ testing history, and planned condition monitoring activities. This plan is written to meet the requirements of Appendix II of the ASME OM Code 2004 Edition.

The intended purpose of the condition monitoring activities for the subject valves is the optimization of testing, examination, and preventive maintenance activities. An analysis of the test and maintenance history has determined that the grouping of these valves is justified. This group of check valves have the same design characteristics, are installed in the same application, and experience similar service conditions.

### Analysis Reference

For the Condition Monitoring analysis and justification details for this group of valves, refer to WCOP-02 Program Plan Change 118. This change package documents the analysis performed to determine the groupings, specifies inservice testing and preventive maintenance activities, and identifies activity intervals and attributes for trending. Change 118 also documents the maintenance history and industry review along with the failure modes expected for this valve group.

**Check Valve Condition Monitoring Plan Basis CVCM-03**
**(Continued)**

**Condition Monitoring Activities**

The information in this section satisfies the requirements of ASME OM Code-2004 Edition, Appendix II section II-4000(b), Optimization of Condition Monitoring Activities. The following details the condition monitoring activities and their implementation frequencies associated with valve group CVCM-03:

| ASSESSMENT TECHNIQUES: | TREND PARAMETER AND FREQUENCY |
|---|---|
| ACOUSTIC MONITORING | Acoustically monitor the valve disc for excessive turbulence to determine if the valve disc is fluttering |
| DISASSEMBLY AND EXAMINATION | Disassemble and examine the valve to inspect for worn, loose, or deformed parts and verify the open and closed capability |
| UT RESULTS | Wall thickness will be monitored to establish the Corrosion life/margin of this valve. If these measurements indicate a wall thickness less than 0.61 inches then further evaluation by Engineering is required |

In accordance with ASME OM Code ISTC-5222, if for any reason the condition monitoring plans for this group of valves is discontinued, then the testing or examination requirements of paragraphs, ISTC-3510, ISTC-3520, ISTC-3530, ISTC-3550, and ISTC-5221 shall apply to the applicable valve(s).

**Compliance**

This plan meets the documentation requirements of Appendix II of the ASME OM Code as follows:

a. This Plan Basis documents the valves included in the group for Condition Monitoring
b. WCOP-02 Program Plan Change 118 documents the date and basis for inclusion of these valves in condition monitoring.
c. WCOP-02 Program Plan Change 118 documents the analysis and basis for the check valve condition monitoring program for these valves.
d. WCOP-02 Program Plan Change 118 documents the failure and maintenance history patterns for the subject valves.
e. This Plan Basis and WCOP-02 Program Plan Change 118 document the condition monitoring activities, attributes and bases for the intervals for each of the valves included in this Plan Basis.

## Check Valve Condition Monitoring Plan Basis CVCM-04

| Valve Number | System | Class | Category |
|---|---|---|---|
| BB8949A | BB | 1 | A/C |
| BB8949B | BB | 1 | A/C |
| BB8949C | BB | 1 | A/C |
| BB8949D | BB | 1 | A/C |

### Function

Valves BB8949B/C are the Residual Heat Removal to Safety Injection System Hot Leg Recirculation Outlet check valves. Valves BB8949A/D are the Safety Injection System Hot Leg Recirculation Outlet check valves. These valves perform an open safety function to allow flow to the hot leg of the RCS during post loss of coolant accident cool-down. Additionally these valves perform a closed safety function as the primary hot leg RCS pressure boundary.

For valves BB8849A and D, the accident condition flow rate is 250 gpm each. For valves BB8849B and C, the accident condition flow rate is 661 gpm each.

### Justification

In accordance with ASME OM Code-2004 Edition, Appendix II, these valves are included in the station Check Valve Condition Monitoring Program. The following describes the basis for grouping the valves, failure analysis, 'maintenance and testing history', and planned condition monitoring activities. This plan is written to meet the requirements of Appendix II of the ASME OM Code 2004 Edition.

The intended purpose of the condition monitoring activities for the subject valves is the optimization of testing, examination, and preventive maintenance activities. An analysis of the test and maintenance history has determined that the grouping of these valves is justified. This group of check valves have the same design characteristics, are installed in the same application, and experience similar service conditions.

### Analysis Reference

For the Condition Monitoring analysis and justification details for this group of valves, refer to WCOP-02 Program Plan Change 120. This change package documents the analysis performed to determine the groupings, specify inservice testing and preventive maintenance activities and identify activity intervals and attributes for trending. Change 120 also documents the maintenance history and industry review along with the failure modes expected for this valve group.

**Check Valve Condition Monitoring Plan Basis CVCM-04**
**(Continued)**

**Condition Monitoring Activities**

The information in this section satisfies the requirements of ASME OM Code-2004 Edition, Appendix II section II-4000(b), Optimization of Condition Monitoring Activities. The Technical Specification leakage test strategy is proven in industry to be very effective in identifying the credible failure mode of excessive seat leakage. The following details the condition monitoring activities and their implementation frequencies associated with this valve group CVCM-04:

| ASSESSMENT TECHNIQUES: | TREND PARAMETER AND FREQUENCY |
|---|---|
| LEAKAGE RATE TESTING | Leak rate data trend - documented once for each cycle. |
| FLOW TESTING | Flow verification – documented once for each cycle. |
| NON-INTRUSIVE TESTING | Periodic non-intrusive testing performed on a sampling basis to verify the open capability. |
| UT RESULTS (BB8949A only) | This valve will be examined to determine minimum wall thickness during refuel 11, 13, and 15. After wall thickness and wear rates have been determined from the UT data and evaluated, the need for additional measures, if any, will be determined and incorporated into the appropriate procedures. |

In accordance with ASME OM Code ISTC-5222, if for any reason the condition monitoring plans for this group of valves is discontinued, then the testing or examination requirements of paragraphs, ISTC-3510, ISTC-3520, ISTC-3530, ISTC-3550, and ISTC-5221 shall apply to the applicable valve(s).

**Compliance**

This plan meets the documentation requirements of Appendix II of the ASME OM Code as follows:

a. This Plan Basis documents the valves included in the group for Condition Monitoring
b. WCOP-02 Program Plan Change 120 documents the date and basis for inclusion of these valves in condition monitoring.
c. WCOP-02 Program Plan Change 120 documents the analysis and basis for the check valve condition monitoring program for these valves.
d. WCOP-02 Program Plan Change 120 documents the failure and maintenance history patterns for the subject valves.
e. This Plan Basis and WCOP-02 Program Plan Change 120 document the condition monitoring activities, attributes and bases for the intervals for each of the valves included in this Plan Basis.

## Check Valve Condition Monitoring Plan Basis CVCM-05

| Valve Number | System | Class | Category |
|---|---|---|---|
| EM8926A | EM | 2 | C |
| EM8926B | EM | 2 | C |

### Function

These valves are the Safety Injection Pump Suction check valves. These valves perform an open safety function to allow flow to the Safety Injection pump suctions during the injection mode following a post Loss of Coolant Accident ( LOCA). These valves perform a closed safety function to prevent back flow of highly contaminated water into the RWST during the post LOCA recirculation phase in the event that either BNHV8806A or BNHV8806B and EMHV8923A&B fail to close. When the RWST low level limit is reached, the suction of the ECCS is aligned to the containment sumps. This scenario could result in the transportation of failed fuel particles, if present, from the containment sump into the ECCS. Closure of these valves would ensure that the potentially highly contaminated water does not flow back to the RWST (which is a tank vented to atmosphere), thus preventing the release of radioactive material to the atmosphere.

### Justification

In accordance with ASME OM Code Appendix II, these valves are included in the station Check Valve Condition Monitoring Program. The following describes the basis for grouping the valves, failure analysis, 'maintenance and testing history', and planned condition monitoring activities. This plan is written to meet the requirements of Appendix II of the ASME OM Code 2004 Edition.

The intended purpose of the condition monitoring activities for the subject valves is the optimization of testing, examination, and preventive maintenance activities. An analysis of the test and maintenance history has determined that the grouping of these valves is justified. This group of check valves have the same design characteristics, are installed in the same application, and experience similar service conditions.

### Analysis Reference

For the Condition Monitoring analysis and justification details for this group of valves, refer to WCOP-02 Program Plan Change 123. This change package documents the analysis performed to determine the groupings, specify inservice testing and preventive maintenance activities and identify activity intervals and attributes for trending. Change 123 also documents the maintenance history and industry review along with the failure modes expected for this valve group.

**Check Valve Condition Monitoring Plan Basis CVCM-05**
**(Continued)**

**Condition Monitoring Activities**

The information in this section satisfies the requirements of ASME OM Code-2004 Edition, Appendix II section II-4000(b), Optimization of Condition Monitoring Activities. The following details the condition monitoring activities and their implementation frequencies associated with valve group CVCM-05:

| ASSESSMENT TECHNIQUES: | TREND PARAMETER AND FREQUENCY |
|---|---|
| LEAKAGE RATE TESTING | Leak rate data trend - documented 100% of the group to be tested within a 4 refueling outage cycles. |
| FLOW TESTING | Flow verification – documented once each quarter. |

In accordance with ASME OM Code ISTC-5222, if for any reason the condition monitoring plans for this group of valves is discontinued, then the testing or examination requirements of paragraphs, ISTC-3510, ISTC-3520, ISTC-3530, ISTC-3550, and ISTC-5221 shall apply to the applicable valve(s).

**Compliance**

This plan meets the documentation requirements of Appendix II of the ASME OM Code as follows:

a. This Plan Basis documents the valves included in the group for Condition Monitoring
b. WCOP-02 Program Plan Change 123 documents the date and basis for inclusion of these valves in condition monitoring.
c. WCOP-02 Program Plan Change 123 documents the analysis and basis for the check valve condition monitoring program for these valves.
d. WCOP-02 Program Plan Change 123 documents the failure and maintenance history patterns for the subject valves.
e. This Plan Basis and WCOP-02 Program Plan Change 123 document the condition monitoring activities, attributes and bases for the intervals for each of the valves included in this Plan Basis.

## Check Valve Condition Monitoring Plan Basis CVCM-06

| Valve Number | System | Class | Category |
|---|---|---|---|
| EPV0010 | EP | 1 | A/C |
| EPV0020 | EP | 1 | A/C |
| EPV0030 | EP | 1 | A/C |
| EPV0040 | EP | 1 | A/C |

### Function

These valves are the Safety Injection to Accumulator Injection Line check valves. These valves perform an open safety function to allow flow from the Safety Injection pumps to the Reactor Coolant System loops following the initiation of a Safety Injection Signal. The close safety function of these valves is to serve as the Reactor Coolant System pressure boundary to protect the EM system from RCS pressure.

### Justification

In accordance with ASME OM Code Appendix II, these valves are included in the station Check Valve Condition Monitoring Program. The following describes the basis for grouping the valves, failure analysis, 'maintenance and testing history', and planned condition monitoring activities. This plan is written to meet the requirements of Appendix II of the ASME OM Code 2004 Edition.

The intended purpose of the condition monitoring activities for the subject valves is the optimization of testing, examination, and preventive maintenance activities. An analysis of the test and maintenance history has determined that the grouping of these valves is justified. This group of check valves have the same design characteristics, are installed in the same application, and experience similar service conditions.

### Analysis Reference

For the Condition Monitoring analysis and justification details for this group of valves, refer to WCOP-02 Program Plan Change 124. This change package documents the analysis performed to determine the groupings, specify inservice testing and preventive maintenance activities, and identify activity intervals and attributes for trending. Change 124 also documents the maintenance history and industry review along with the failure modes expected for this valve group.

### Condition Monitoring Activities

The information in this section satisfies the requirements of ASME OM Code-2004 Edition, Appendix II section II-4000(b), Optimization of Condition Monitoring Activities. The Technical Specification leakage test strategy is proven in industry to be very effective in identifying the credible failure mode of excessive seat leakage. The following details the condition monitoring activities and their implementation frequencies associated with valve group CVCM-06:

**Check Valve Condition Monitoring Plan Basis CVCM-06**
**(Continued)**

| ASSESSMENT TECHNIQUES: | TREND PARAMETER AND FREQUENCY |
|---|---|
| LEAKAGE RATE TESTING | Leak rate data trend - documented once for each cycle. |
| FLOW TESTING | Flow verification – documented once for each cycle. |
| NON-INTRUSIVE TESTING | Periodic non-intrusive testing performed on a sampling basis to verify the open capability. |

In accordance with ASME OM Code ISTC-5222, if for any reason the condition monitoring plans for this group of valves is discontinued, then the testing or examination requirements of paragraphs, ISTC-3510, ISTC-3520, ISTC-3530, ISTC-3550, and ISTC-5221 shall apply to the applicable valve(s).

**Compliance**

This plan meets the documentation requirements of Appendix II of the ASME OM Code as follows:

a. This Plan Basis documents the valves included in the group for Condition Monitoring
b. WCOP-02 Program Plan Change 124 documents the date and basis for inclusion of these valves in condition monitoring.
c. WCOP-02 Program Plan Change 124 documents the analysis and basis for the check valve condition monitoring program for these valves.
d. WCOP-02 Program Plan Change 124 documents the failure and maintenance history patterns for the subject valves.
e. This Plan Basis and WCOP-02 Program Plan Change 124 document the condition monitoring activities, attributes and bases for the intervals for each of the valves included in this Plan Basis.

## Check Valve Condition Monitoring Plan Basis CVCM-07

| Valve Number | System | Class | Category |
|---|---|---|---|
| EJ8958A | EJ | 2 | C |
| EJ8958B | EJ | 2 | C |

### Function

These valves are the Residual Heat Removal Pump Suction check valves. These valves perform an open safety function to allow flow from the RWST to the Residual Heat Removal pumps during the injection mode following a Loss of Coolant Accident (LOCA). The accident condition flow for these valves is 3860 gpm each. These valves perform a close safety function to prevent back flow of highly contaminated water into the RWST during normal cool-down and during the post-LOCA recirculation phase in the event BNHV8812A or BNHV8812B fail to close. When the RWST low level limit is reached, the suction of the ECCS is aligned to the containment sumps. This scenario could result in the transportation of failed fuel particles, if present, from the containment sump into the ECCS. Closure of these valves would ensure that the potentially highly contaminated water does not flow back to the RWST (which is a tank vented to atmosphere), thus preventing the release of radioactive material to the atmosphere.

### Justification

In accordance with ASME OM Code Appendix II, these valves are included in the station Check Valve Condition Monitoring Program. The following describes the basis for grouping the valves, failure analysis, 'maintenance and testing history', and planned condition monitoring activities. This plan is written to meet the requirements of Appendix II of the ASME OM Code 2004 Edition.

The intended purpose of the condition monitoring activities for the subject valves is the optimization of testing, examination, and preventive maintenance activities. An analysis of the test and maintenance history has determined that the grouping of these valves is justified. This group of check valves have the same design characteristics, are installed in the same application, and experience similar service conditions.

### Analysis Reference

For the Condition Monitoring analysis and justification details for this group of valves, refer to WCOP-02 Program Plan Change 125. This change package documents the analysis performed to determine the groupings, specify inservice testing and preventive maintenance activities, and identify activity intervals and attributes for trending. Change 125 also documents the maintenance history and industry review along with the failure modes expected for this valve group.

**Check Valve Condition Monitoring Plan Basis CVCM-07**
**(Continued)**

**Condition Monitoring Activities**

The information in this section satisfies the requirements of the ASME OM Code-2004 Edition, Appendix II section II-4000(b), Optimization of Condition Monitoring Activities. The following details the condition monitoring activities and their implementation frequencies associated with valve group CVCM-07:

| ASSESSMENT TECHNIQUES: | TREND PARAMETER AND FREQUENCY |
|---|---|
| LEAKAGE RATE TESTING | Leak rate data trend - documented 100% of the group to be tested within 2 refueling outage cycles. |
| FLOW TESTING | Flow verification – documented once each quarter. |

In accordance with ASME OM Code ISTC-5222, if for any reason the condition monitoring plans for this group of valves is discontinued, then the testing or examination requirements of paragraphs, ISTC-3510, ISTC-3520, ISTC-3530, ISTC-3550, and ISTC-5221 shall apply to the applicable valve(s).

**Compliance**

This plan meets the documentation requirements of Appendix II of the ASME OM Code as follows:

a. This Plan Basis documents the valves included in the group for Condition Monitoring
b. WCOP-02 Program Plan Change 125 documents the date and basis for inclusion of these valves in condition monitoring.
c. WCOP-02 Program Plan Change 125 documents the analysis and basis for the check valve condition monitoring program for these valves.
d. WCOP-02 Program Plan Change 125 documents the failure and maintenance history patterns for the subject valves.
e. This Plan Basis and WCOP-02 Program Plan Change 125 document the condition monitoring activities, attributes and bases for the intervals for each of the valves included in this Plan Basis.

## Check Valve Condition Monitoring Plan Basis CVCM-08

| Valve Number | System | Class | Category |
|---|---|---|---|
| EJ8969A | EJ | 2 | C |
| EJ8969B | EJ | 2 | C |

### Function

Valve EJ8969A is the RHR A to Centrifugal Charging Pumps Check Valve. Valve EJ8969B is the RHR B to SI Pumps Check Valve. These valves open to provide a flow path for water which has been taken from the Containment Sump, through the RHR Pumps and Heat Exchanger, to the suction of either the Centrifugal Charging Pumps or the Safety Injection Pumps (as required) during the recirculation phase following a Loss of Coolant Accident (LOCA).

### Justification

In accordance with ASME OM Code Appendix II, these valves are included in the station Check Valve Condition Monitoring Program. The following describes the basis for grouping the valves, failure analysis, 'maintenance and testing history', and planned condition monitoring activities. This plan is written to meet the requirements of Appendix II of the ASME OM Code 2004 Edition.

The intended purpose of the condition monitoring activities for the subject valves is the optimization of testing, examination, and preventive maintenance activities. An analysis of the test and maintenance history has determined that the grouping of these valves is justified. This group of check valves have the same design characteristics, are installed in the same application, and experience similar service conditions.

### Analysis Reference

For the Condition Monitoring analysis and justification details for this group of valves, refer to WCOP-02 Program Plan Change 126. This change package documents the analysis performed to determine the groupings, specify inservice testing and preventive maintenance activities and identify activity intervals and attributes for trending. Change 126 also documents the maintenance history and industry review along with the failure modes expected for this valve group.

**Check Valve Condition Monitoring Plan Basis CVCM-08**
**(Continued)**

**Condition Monitoring Activities**

The information in this section satisfies the requirements of ASME OM Code-2004 Edition, Appendix II section II-4000(b), Optimization of Condition Monitoring Activities. The following details the condition monitoring activities and their implementation frequencies associated with valve group CVCM-08:

| ASSESSMENT TECHNIQUES: | TREND PARAMETER AND FREQUENCY |
|---|---|
| FLOW TESTING | Flow verification – documented in accordance with sampling plan. |
| RADIOGRAPHY | Closure verification – documented in accordance with sampling plan. |
| | |

In accordance with ASME OM Code ISTC-5222, if for any reason the condition monitoring plans for this group of valves is discontinued, then the testing or examination requirements of paragraphs, ISTC-3510, ISTC-3520, ISTC-3530, ISTC-3550, and ISTC-5221 shall apply to the applicable valve(s).

**Compliance**

This plan meets the documentation requirements of Appendix II of the ASME OM Code as follows:

a. This Plan Basis documents the valves included in the group for Condition Monitoring
b. WCOP-02 Program Plan Change 126 documents the date and basis for inclusion of these valves in condition monitoring.
c. WCOP-02 Program Plan Change 126 documents the analysis and basis for the check valve condition monitoring program for these valves.
d. WCOP-02 Program Plan Change 126 documents the failure and maintenance history patterns for the subject valves.
e. This Plan Basis and WCOP-02 Program Plan Change 126 document the condition monitoring activities, attributes and bases for the intervals for each of the valves included in this Plan Basis.

## Check Valve Condition Monitoring Plan Basis CVCM-09

| Valve Number | System | Class | Category |
|---|---|---|---|
| EP8956A | EP | 1 | A/C |
| EP8956B | EP | 1 | A/C |
| EP8956C | EP | 1 | A/C |
| EP8956D | EP | 1 | A/C |

### Function

These valves are the Accumulator Tank Discharge Check Valves. The open safety function of these valves is to provide a flow path for the discharge of the contents of the SI Accumulator TEP01A/B/C/D into the RCS in the event of a decrease in pressure (e.g., a LOCA). The closed safety function is to act as an RCS pressure boundary valve preventing loss of RCS inventory and over-pressurization of the SI Accumulator.

### Justification

In accordance with ASME OM Code Appendix II, these valves are included in the station Check Valve Condition Monitoring Program. The following describes the basis for grouping the valves, failure analysis, 'maintenance and testing history', and planned condition monitoring activities. This plan was written to meet the requirements of Appendix II of the ASME OM Code 2004 Edition.

The intended purpose of the condition monitoring activities for the subject valves is the optimization of testing, examination, and preventive maintenance activities. An analysis of the test and maintenance history has determined that the grouping of these valves is justified. This group of check valves have the same design characteristics, are installed in the same application, and experience similar service conditions.

### Analysis Reference

For the Condition Monitoring analysis and justification details for this group of valves, refer to WCOP-02 Program Plan Change 127. This change package documents the analysis performed to determine the groupings, specify inservice testing and preventive maintenance activities and identify activity intervals and attributes for trending. Change 127 also documents the maintenance history and industry review along with the failure modes expected for this valve group.

### Condition Monitoring Activities

The information in this section satisfies the requirements of the ASME OM Code-2004 Edition, Appendix II section II-4000(b), Optimization of Condition Monitoring Activities. The Technical Specification leakage test strategy is proven in industry to be very effective in identifying the credible failure mode of excessive seat leakage. The following details the condition monitoring activities and their implementation frequencies associated with valve group CVCM-09:

**Check Valve Condition Monitoring Plan Basis CVCM-09**
**(Continued)**

| ASSESSMENT TECHNIQUES: | TREND PARAMETER AND FREQUENCY |
|---|---|
| LEAKAGE RATE TESTING | Leak rate data trend - documented once for each cycle. |
| FLOW TESTING | Flow verification – documented once for each cycle. |

In accordance with ASME OM Code ISTC-5222, if for any reason the condition monitoring plans for this group of valves is discontinued, then the testing or examination requirements of paragraphs, ISTC-3510, ISTC-3520, ISTC-3530, ISTC-3550, and ISTC-5221 shall apply to the applicable valve(s).

**Compliance**

This plan meets the documentation requirements of Appendix II of the ASME OM Code as follows:

a. This Plan Basis documents the valves included in the group for Condition Monitoring
b. WCOP-02 Program Plan Change 127 documents the date and basis for inclusion of these valves in condition monitoring.
c. WCOP-02 Program Plan Change 127 documents the analysis and basis for the check valve condition monitoring program for these valves.
d. WCOP-02 Program Plan Change 127 documents the failure and maintenance history patterns for the subject valves.
e. This Plan Basis and WCOP-02 Program Plan Change 127 document the condition monitoring activities, attributes and bases for the intervals for each of the valves included in this Plan Basis.

**Check Valve Condition Monitoring Plan Basis CVCM-10**

| Valve Number | System | Class | Category |
|---|---|---|---|
| BGV0591 | BG | 2 | C |

## Function

This check valve must open to provide a flow path from the Centrifugal Charging Pumps to the reactor coolant pumps seals following a safety injection actuation [UFSAR 9.3.4]. This flow path provides a source of borated water to the RCS via the reactor coolant pump labyrinth seals during accident conditions. During normal power operation this valve provides a flow path from the normal charging to the reactor coolant pump seals.

This valve will also close to prevent reverse flow from the reactor coolant pump seals in the event of a seal failure, however downstream check valves are relied upon for this closure function.

## Justification

In accordance with ASME OM Code Appendix II, this valve is included in the station Check Valve Condition Monitoring Program. The following describes the basis for grouping the valves, failure analysis, 'maintenance and testing history', and planned condition monitoring activities. This plan was written to meet the requirements of Appendix II of the ASME OM Code 2004 Edition

The intended purpose of the condition monitoring activities for the subject valves is the optimization of testing, examination, and preventive maintenance activities.

## Analysis Reference

For the Condition Monitoring analysis and justification details for this valve, refer to WCOP-02 Program Plan Change 133. This change package documents the analysis performed to determine the groupings, specify inservice testing and preventive maintenance activities, and identify activity intervals and attributes for trending. Change 133 also documents the maintenance history and industry review along with the failure modes expected for this valve.

## Condition Monitoring Activities

The information in this section satisfies the requirements of ASME OM Code-2004 Edition, Appendix II section II-4000(b), Optimization of Condition Monitoring Activities. The following details the condition monitoring activities and their implementation frequencies associated with BGV0591:

**Check Valve Condition Monitoring Plan Basis CVCM-10**
**(Continued)**

| ASSESSMENT TECHNIQUES: | TREND PARAMETER AND FREQUENCY |
|---|---|
| FLOW TESTING | Flow verification – documented during normal operation. |
| RADIOGRAPHY | Closure verification - documented every other cycle. |

In accordance with ASME OM Code ISTC-5222, if for any reason the condition monitoring plans for this valve group is discontinued, then the testing or examination requirements of paragraphs, ISTC-3510, ISTC-3520, ISTC-3530, ISTC-3550, and ISTC-5221 shall apply to the applicable valve.

**Compliance**

This plan meets the documentation requirements of Appendix II of the ASME OM Code as follows:

a. This Plan Basis documents the valves included in the group for Condition Monitoring
b. WCOP-02 Program Plan Change 133 documents the date and basis for inclusion of this valve in condition monitoring.
c. WCOP-02 Program Plan Change 133 documents the analysis and basis for the check valve condition monitoring program for this valve.
d. WCOP-02 Program Plan Change 133 documents the failure and maintenance history patterns for the subject valves.
e. This Plan Basis and WCOP-02 Program Plan Change 133 document the condition monitoring activities, attributes and bases for the intervals for each of the valves included in this Plan Basis.

**Check Valve Condition Monitoring Plan Basis CVCM-11**

| Valve Number | System | Class | Category |
|---|---|---|---|
| ALV0001 | AL | 3 | C |
| ALV0030 | AL | 3 | C |
| ALV0042 | AL | 3 | C |
| ALV0054 | AL | 3 | C |
| ALV0057 | AL | 2 | C |
| ALV0062 | AL | 2 | C |
| ALV0067 | AL | 2 | C |
| ALV0072 | AL | 2 | C |
| ALV0161 | AL | 3 | C |
| FCV0001 | FC | 2 | C |
| FCV0002 | FC | 2 | C |
| FCV0024 | FC | 2 | C |
| FCV0025 | FC | 2 | C |

**Function**

ALV0001 (not in a group)

Valve ALV0001 is the Turbine Driven Auxiliary Feed Water (TDAFW) pump suction line check valve. The Condensate Storage Tank is the source of purified water for the Auxiliary Feed Water system, but is not the source credited in the safety analysis. The Essential Service Water (EF) System is credited as the safety- related water source for the Auxiliary Feed Water system with it's supply of raw lake water. As the injection of raw lake water into the feedwater system has the potential of resulting in the degradation of the Steam Generator tubes, valve ALV0001 performs a close function so as to isolate the Condensate Storage Tank from the potential addition of lake water from the EF System, and performs a closed safety function so as to not allow flow from the ESW system to be diverted from the Aux Feed Water Pump to the condensate storage system. ALV0001 performs an open function to allow the preferred source of water to be injected into the feedwater system for long term reliability of the Steam Generators. While the open function is important, it is not considered a safety- related function as described under the ASME OM Code scope statement. This valve does not have seat leakage limits.

ALV0030; ALV0042 (Grouped)

ALV0030 and ALV0042 are the Motor-Driven Auxiliary Feedwater Pumps PAL01B and PAL01A discharge check valves, respectively. These valves have an open safety function to permit flow to the Steam Generators for normal and emergency cool down. These valves have no closed safety function as described under the ASME OM Code scope statement and do not perform an important closing function. These valves do not have seat leakage limits.

**Check Valve Condition Monitoring Plan Basis CVCM-11**
**(Continued)**

ALV0054 (not in a group)

Valve ALV0054 is the TDAFW pump discharge check valve. This valve performs an open safety function to allow injection of Auxiliary Feedwater from the TDAFW pump to the Steam Generators for normal and emergency cool down. This valve has no close safety function as described under the ASME OM Code scope statement and does not perform an important close function. This valve does not have seat leakage limits.

ALV0057/62/67/72 (grouped)

Valves ALV0057/62/67/72 perform an open safety function to allow injection of Auxiliary Feedwater from the TDAFW pump to each Steam Generator. These valves have no close safety function as described under the ASME OM Code scope statement and do not perform an important close function. These valves do not have seat leakage limits.

Valve ALV0161 (not in a group)

Valve ALV0161 is a Turbine Driven Auxiliary Feed Water (TDAFW) pump Condensate Storage Tank (CST) suction check valve. The CST is the source of purified water for the AFW system, but is not credited in the safety analysis. The Essential Service Water (EF) System is credited as the safety related water source for the AFW system with it's supply of raw lake water. Valve ALV0161 performs a closed safety function so as to prevent backflow from the TDAFWP standby tanks, TAL01A, TAL01B and TAL01C to the CST. ALV0161 performs an open function to allow the preferred source of water to be injected into the feedwater system for long term reliability of the Steam Generators. While the open function in important, it is not considered a safety related function as described under the ASME OM Code scope statement (ISTA-1100). This valve does not have seat leakage limits.

FCV0001/2/24/25 (grouped)

Valves FCV0001;2;24;25 perform an open function to provide a flow path for steam to be used as the motive force in driving the turbine of the Auxiliary Feedwater Pump, PAL02, for both normal and emergency cool down conditions. Valves FCV0001 and FCV0024 are installed in series in the flow path from Steam Generator EBB01B. Valves FCV0002 and FCV0025 are installed in series in the flow path from Steam Generator EBB01C. The series configuration was designed to mitigate the consequences of a single valve failure to close in Steam Generator failure event scenarios. In the event either EBB01B or EBB01C is faulted or the applicable steam line has failed, the check valves from the subject line will perform a closed safety function to isolate and maintain steam inventory in the functioning Steam Generator. These valves do not have seat leakage limits due to the series configuration.

In summary, the safety significant functions of ALV0001, ALV0161, and FCV0001, 2, 24, 25 are to both open and close. The safety significant functions of ALV0054, 57, 62, 67, 72 are to open

**Check Valve Condition Monitoring Plan Basis CVCM-11**
**(Continued)**

## Justification

In accordance with ASME OM Code Appendix II, these valves are included in the station Check Valve Condition Monitoring Program. The following describes the basis for grouping the valves, failure analysis, 'maintenance and testing history', and planned condition monitoring activities. This plan was written to meet the requirements of Appendix II of the ASME OM Code 2004 Edition.

The intended purpose of the condition monitoring activities for the subject valves is the optimization of testing, examination, and preventive maintenance activities. An analysis of the test and maintenance history has determined that the grouping of these valves is justified. The groupings of check valves in this justification have the same design characteristics, are installed in the same application, and experience similar service conditions.

## Analysis Reference

For the Condition Monitoring analysis and justification details for this group of valves, refer to WCOP-02 Program Plan Change 138 and 168. This change documents the analysis performed to determine the groupings, specify inservice testing and preventive maintenance activities and identify activity intervals and attributes for trending. Change 138 also documents the maintenance history and industry review along with the failure modes expected for this valve group. A change in system performance resulted in the ability to test ALV0054 more often. Refer to WCOP-02 change 154 for details about the change in test methods for ALV0054.

## Condition Monitoring Activities

The information in this section satisfies the requirements of ASME OM Code-2004 Edition, Appendix II section II-4000(b), Optimization of Condition Monitoring Activities. The following details the condition monitoring activities and their implementation frequencies associated with valve group CVCM-11:

| ASSESSMENT TECHNIQUES: | TREND PARAMETER AND FREQUENCY |
|---|---|
| FLOW TESTING | Exercised during quarterly pump testing at minimum flow conditions and full flow during refueling outages. |
| DISASSEMBLY AND EXAMINATION | Sample disassembly and examination to inspect for worn, loose, or deformed parts and to verify the open and closed capability (FCV0001/2/24/25). |
| RADIOGRAPHY | Closed position verification on a refueling outage frequency for valves which cannot be readily verified closed by other practical means (ALV0030;42) |

**Check Valve Condition Monitoring Plan Basis CVCM-11**
**(Continued)**

In accordance with ASME OM Code ISTC-5222, if for any reason the condition monitoring plans for this group of valves is discontinued, then the testing or examination requirements of paragraphs, ISTC-3510, ISTC-3520, ISTC-3530, ISTC-3550, and ISTC-5221 shall apply to the applicable valve(s).

**Compliance**

This plan meets the documentation requirements of Appendix II of the ASME OM Code as follows:

a. This Plan Basis documents the valves included in the group for Condition Monitoring
b. WCOP-02 Program Plan Change 138 and 168 documents the date and basis for inclusion of these valves in condition monitoring.
c. WCOP-02 Program Plan Change 138 and 168 documents the analysis and basis for the check valve condition monitoring program for these valves.
d. WCOP-02 Program Plan Change 138 and 168 documents the failure and maintenance history patterns for the subject valves.
e. This Plan Basis and WCOP-02 Program Plan Change 138 and 168 document the condition monitoring activities, attributes and bases for the intervals for each of the valves included in this Plan Basis.

**Check Valve Condition Monitoring Plan Basis CVCM-12**

| Valve Number | System | Class | Category |
|---|---|---|---|
| GSV0054 | GS | 2 | C |
| GSV0059 | GS | 2 | C |

## Function

These check valves must close to isolate the post-accident sampling system from the hydrogen analyzer. Valve closure ensures that during post LOCA conditions, samples may be returned to the containment atmosphere [USAR 6.2.5]. These valves are not considered a containment isolation valves since downstream valves, GSHV0008/9 are relied upon to isolate containment [USAR Figure 6.2.4-1].

These valves open to provide a return flow path from the post-accident sampling system to the containment atmosphere. This function is not required for safe shutdown or accident mitigation since the post-accident sampling system is not required.

## Justification

In accordance with ASME OM Code Appendix II, these valves are included in the station Check Valve Condition Monitoring Program. The following describes the basis for grouping the valves, failure analysis, 'maintenance and testing history', and planned condition monitoring activities. This plan is written to meet the requirements of Appendix II of the ASME OM Code 2004 Edition.

The intended purpose of the condition monitoring activities for the subject valves is the optimization of testing, examination, and preventive maintenance activities. An analysis of the test and maintenance history has determined that the grouping of these valves is justified. This group of check valves have the same design characteristics, are installed in the same application, and experience similar service conditions.

## Analysis Reference

For the Condition Monitoring analysis and justification details for this group of valves, refer to WCOP-02 Program Plan Change 145. This change package documents the analysis performed to determine the groupings, specify inservice testing and preventive maintenance activities, and identify activity intervals and attributes for trending. Change 145 also documents the maintenance history and industry review along with the failure modes expected for this valve group.

## Condition Monitoring Activities

The information in this section satisfies the requirements of ASME OM Code-2004 Edition, Appendix II section II-4000(b), Optimization of Condition Monitoring Activities. The following details the condition monitoring activities and their implementation frequencies associated with valve group CVCM-12:

**Check Valve Condition Monitoring Plan Basis CVCM-12**
**(Continued)**

| ASSESSMENT TECHNIQUES: | TREND PARAMETER AND FREQUENCY |
|---|---|
| DISASSEMBLY AND EXAMINATION | Sample disassembly and examination to inspect for worn, loose, or deformed parts and to verify the open and closed capability. |

In accordance with ASME OM Code ISTC-5222, if for any reason the condition monitoring plans for this group of valves is discontinued, then the testing or examination requirements of paragraphs, ISTC-3510, ISTC-3520, ISTC-3530, ISTC-3550, and ISTC-5221 shall apply to the applicable valve(s).

**Compliance**

This plan meets the documentation requirements of Appendix II of the ASME OM Code as follows:

a. This Plan Basis documents the valves included in the group for Condition Monitoring
b. WCOP-02 Program Plan Change 145 documents the date and basis for inclusion of these valves in condition monitoring.
c. WCOP-02 Program Plan Change 145 documents the analysis and basis for the check valve condition monitoring program for these valves.
d. WCOP-02 Program Plan Change 145 documents the failure and maintenance history patterns for the subject valves.
e. This Plan Basis and WCOP-02 Program Plan Change 145 document the condition monitoring activities, attributes and bases for the intervals for each of the valves included in this Plan Basis.

## Check Valve Condition Monitoring Plan Basis CVCM-13

| Valve Number | System | Class | Category |
|---|---|---|---|
| EMV0001 | EM | 1 | A/C |
| EMV0002 | EP | 1 | A/C |
| EMV0003 | EP | 1 | A/C |
| EMV0004 | EP | 1 | A/C |

### Function

These check valves are the Safety Injection System (SIS) to RCS Hot Leg check valves. These valves perform an open safety function to provide a flow path to the hot leg of the RCS following a loss of coolant accident. These valves perform a closed safety function as the secondary hot leg RCS pressure boundary isolation.

### Justification

In accordance with ASME OM Code Appendix II, these valves are included in the station Check Valve Condition Monitoring Program. The following describes the basis for grouping the valves, failure analysis, 'maintenance and testing history', and planned condition monitoring activities. This plan is written to meet the requirements of Appendix II of the ASME OM Code 2004 Edition.

The intended purpose of the condition monitoring activities for the subject valves is the optimization of testing, examination, and preventive maintenance activities. An analysis of the test and maintenance history has determined that the grouping of these valves is justified. This group of check valves have the same design characteristics, are installed in the same application, and experience similar service conditions.

### Analysis Reference

For the Condition Monitoring analysis and justification details for this group of valves, refer to WCOP-02 Program Plan Change 122. This change package documents the analysis performed to determine the groupings, specify inservice testing and preventive maintenance activities, and identify activity intervals and attributes for trending. Change 122 also documents the maintenance history and industry review along with the failure modes expected for this valve group.

### Condition Monitoring Activities

The information in this section satisfies the requirements of ASME OM Code-2004 Edition, Appendix II section II-4000(b), Optimization of Condition Monitoring Activities. The Technical Specification leakage test strategy is proven in industry to be very effective in identifying the credible failure mode of excessive seat leakage. The following details the condition monitoring activities and their implementation frequencies associated with this valve group CVCM-13:

**Check Valve Condition Monitoring Plan Basis CVCM-13**
**(Continued)**

The accident condition flow for these valves is 250 gpm each. The hot leg injection flow path is rarely used during normal shutdown conditions; therefore the majority of flow through these valves has been generated by the Inservice Testing Program. Because of the infrequent use of these flow paths, it would be very difficult to determine if abnormal conditions exist under normal operating conditions.

A credible failure mode for all of these valves is a failure to seat. A periodic seat leakage test is sufficient to determine the condition of the valves with respect to their ability to perform their intended safety functions. The test frequency of this periodic test will be every refueling. This is within the requirements of the test frequency limitations.

STS CV-104 and the procedures referenced therein will be used to ensure that these valves are flowed through every refueling cycle to satisfy the bi-directional flow restrictions of the ASME OM Code. A periodic non-intrusive test will be performed on one of the four valves every refueling outage to demonstrate open function capability. This additional flow verification is being performed to compensate for the fact that the hot leg flow paths are rarely used and flow originates from divergent sources. The sampling plan and frequency for each valve is identified in STS CV-104.

In accordance with ASME OM Code ISTC-5222, if for any reason the condition monitoring plans for this group of valves is discontinued, then the testing or examination requirements of paragraphs, ISTC-3510, ISTC-3520, ISTC-3530, ISTC-3550, and ISTC-5221 shall apply to the applicable valve(s).

**Compliance**

This plan meets the documentation requirements of Appendix II of the ASME OM Code as follows:

a. This Plan Basis documents the valves included in the group for Condition Monitoring
b. WCOP-02 Program Plan Change 122 documents the date and basis for inclusion of these valves in condition monitoring.
c. WCOP-02 Program Plan Change 122 documents the analysis and basis for the check valve condition monitoring program for these valves.
d. WCOP-02 Program Plan Change 122 documents the failure and maintenance history patterns for the subject valves.
e. This Plan Basis and WCOP-02 Program Plan Change 122 document the condition monitoring activities, attributes and bases for the intervals for each of the valves included in this Plan Basis.

**Check Valve Condition Monitoring Plan Basis CVCM-14**

| Valve Number | System | Class | Category |
|---|---|---|---|
| BB8948A | BB | 1 | A/C |
| BB8948B | BB | 1 | A/C |
| BB8948C | BB | 1 | A/C |
| BB8948D | BB | 1 | A/C |

## Function

Valves BB8948A/B/C/D are the SI/Accumulator Loop Check Valves. The open safety function of these valves is to provide a flow path to allow for the discharge of the contents of the SI Accumulator TEP01A/B/C/D into the RCS in the event of a sudden decrease in pressure (e.g., a LOCA). This is also the discharge flow path from the Safety Injection and Residual Heat Removal cold leg injection. The closed safety function is to act as an RCS pressure boundary valve preventing loss of RCS inventory and over-pressurization of the SI Accumulator, Safety Injection System, and Residual Heat Removal (RHR) System.

## Justification

In accordance with ASME OM Code Appendix II, these valves are included in the station Check Valve Condition Monitoring Program. The following describes the basis for grouping the valves, failure analysis, 'maintenance and testing history', and planned condition monitoring activities. This plan is written to meet the requirements of Appendix II of the ASME OM Code 2004 Edition.

The intended purpose of the condition monitoring activities for the subject valves is the optimization of testing, examination, and preventive maintenance activities. An analysis of the test and maintenance history has determined that the grouping of these valves is justified. This group of check valves have the same design characteristics, are installed in the same application, and experience similar service conditions.

## Analysis Reference

For the Condition Monitoring analysis and justification details for this group of valves, refer to WCOP-02 Program Plan Change 128. This change package documents the analysis performed to determine the groupings, specify inservice testing and preventive maintenance activities and identify activity intervals and attributes for trending. Change 128 also documents the maintenance history and industry review along with the failure modes expected for this valve group.

## Condition Monitoring Activities

The information in this section satisfies the requirements of ASME OM Code-2004 Edition, Appendix II section II-4000(b), Optimization of Condition Monitoring Activities. The Technical Specification leakage test strategy is proven in industry to be very effective in identifying the credible failure mode of excessive seat leakage. The following details the condition monitoring activities and their implementation frequencies associated with this valve group CVCM-14:

**Check Valve Condition Monitoring Plan Basis CVCM-14**
**(Continued)**

As these valves receive the highest amount of accident flow from their respective Accumulator, which varies throughout their discharge, they do not have a constant accident condition flow. Instead operating acceptably is determined through the measurement of L/D (equivalently a measurement of line friction). The open acceptance criteria for these valves is an L/D of less than 600. The leak test acceptance criteria is less than or equal to 5.0 GPM per Technical Specification SR 3.4.14.1. Flow through these valves is generated primarily by the RHR system during shutdown.

A credible failure mode for all of these valves is a failure to seat. The Technical Specification seat leakage test is sufficient to determine the condition of the valves with respect to their ability to perform their intended safety functions. The frequency of this periodic test will be every refueling. This is within the requirements of the ASME OM Code test frequency limitations.

STS EP-210 and the procedures referenced therein will be used to ensure that these valves are flowed through every refueling cycle to satisfy the bi-directional flow restrictions. The flow in STS EP-210 will be sufficient to demonstrate that the valve opens prior to leak testing.

In accordance with ASME OM Code ISTC-5222, if for any reason the condition monitoring plans for this group of valves is discontinued, then the testing or examination requirements of paragraphs, ISTC-3510, ISTC-3520, ISTC-3530, ISTC-3550, and ISTC-5221 shall apply to the applicable valve(s).

**Compliance**

This plan meets the documentation requirements of Appendix II of the ASME OM Code as follows:

a. This Plan Basis documents the valves included in the group for Condition Monitoring
b. WCOP-02 Program Plan Change 128 documents the date and basis for inclusion of these valves in condition monitoring.
c. WCOP-02 Program Plan Change 128 documents the analysis and basis for the check valve condition monitoring program for these valves.
d. WCOP-02 Program Plan Change 128 documents the failure and maintenance history patterns for the subject valves.
e. This Plan Basis and WCOP-02 Program Plan Change 128 document the condition monitoring activities, attributes and bases for the intervals for each of the valves included in this Plan Basis.

## Check Valve Condition Monitoring Plan Basis CVCM-15

| Valve Number | System | Class | Category |
|---|---|---|---|
| EJ8841A | EJ | 1 | A/C |
| EJ8841B | EJ | 1 | A/C |

### Function

Valves EJ8841A&B are the Residual Heat Removal (RHR) to Safety Injection System (SIS) Hot Leg Recirculation Outlet check valves. These valves perform an open safety function to allow flow from RHR Pump and RHR HX to the hot leg of the RCS post LOCA in order to satisfy cool-down requirements. These valves perform a closed safety function to protect the RHR system from RCS pressure.

### Justification

In accordance with ASME OM Code Appendix II, these valves are included in the station Check Valve Condition Monitoring Program. The following describes the basis for grouping the valves, failure analysis, 'maintenance and testing history', and planned condition monitoring activities. This plan is written to meet the requirements of Appendix II of the ASME OM Code 2004 Edition.

The intended purpose of the condition monitoring activities for the subject valves is the optimization of testing, examination, and preventive maintenance activities. An analysis of the test and maintenance history has determined that the grouping of these valves is justified. This group of check valves have the same design characteristics, are installed in the same application, and experience similar service conditions.

### Analysis Reference

For the Condition Monitoring analysis and justification details for this group of valves, refer to WCOP-02 Program Plan Change 119. This change procedure documents the analysis performed to determine the groupings, specify inservice testing and preventive maintenance activities and identify activity intervals and attributes for trending. Change 119 also documents the maintenance history and industry review along with the failure modes expected for this valve group.

### Condition Monitoring Activities

The information in this section satisfies the requirements of ASME OM Code-2004 Edition, Appendix II section II-4000(b), Optimization of Condition Monitoring Activities. The Technical Specification leakage test strategy is proven in industry to be very effective in identifying the credible failure mode of excessive seat leakage. The following details the condition monitoring activities and their implementation frequencies associated with this valve group CVCM-15:

**Check Valve Condition Monitoring Plan Basis CVCM-15**
**(Continued)**

A credible failure mode for these valves is a failure to seat. A periodic seat leakage test is sufficient to determine the condition of the valves with respect to their ability to perform their intended safety functions. The frequency of this periodic test will be every refueling. These valves normally do not see flow unless they are tested. STS CV-102 and the procedures referenced therein will be used to ensure that these valves are flowed through every refueling cycle to satisfy the bi-directional flow restrictions.

In accordance with ASME OM Code ISTC-5222, if for any reason the condition monitoring plans for this group of valves is discontinued, then the testing or examination requirements of paragraphs, ISTC-3510, ISTC-3520, ISTC-3530, ISTC-3550, and ISTC-5221 shall apply to the applicable valve(s).

**Compliance**

This plan meets the documentation requirements of Appendix II of the ASME OM Code as follows:

f. This Plan Basis documents the valves included in the group for Condition Monitoring

g. WCOP-02 Program Plan Change 119 documents the date and basis for inclusion of these valves in condition monitoring.

h. WCOP-02 Program Plan Change 119 documents the analysis and basis for the check valve condition monitoring program for these valves.

i. WCOP-02 Program Plan Change 119 documents the failure and maintenance history patterns for the subject valves.

j. This Plan Basis and WCOP-02 Program Plan Change 119 document the condition monitoring activities, attributes and bases for the intervals for each of the valves included in this Plan Basis.

## ATTACHMENT 12

## TECHNICAL POSITION INDEX

| Technical Position No. | Description |
|---|---|
| TP-01 | Bi-directional Testing of Check Valves |
| TP-02 | Testing of Power Operated Valves with Both Active and Passive Safety |
| TP-03 | Passive Valves without Test Requirements |
| TP-04 | Fail Safe Testing of Valves |
| TP-05 | Classification of Skid Mounted Components |
| TP-06 | Not Used |
| TP-07 | Method for Establishing Acceptance Criteria for Power Operated Valves |
| TP-08 | Check Valves in Regular Use |
| TP-09 | Categorization of IST Pumps (Group A or B) |
| TP-10 | Check Valves Tested Using Disassembly and Examination |
| TP-11 | Motor Operated Valve OMN-1 Code Case Position |
| TP-12 | Classification of Check Valves KCV0478 and SJV0111 as Passive |

## ATTACHMENT 13

## TECHNICAL POSITIONS

## Technical Position TP-01
(Page 1 of 3)

## Bi-directional Testing of Check Valves with Non-Safety Positions

### Purpose

The purpose of this Technical Position is to establish the station position for the verification of the non-safety direction exercise testing of check valves by normal plant operations.

### Applicability

This Technical Position is applicable to those valves which are included in the Inservice Testing Program that are required to be exercise tested in their non-safety related direction of flow. This position applies to those check valves required to be tested in accordance with Subsection ISTC (ASME OM Code 2004 Edition through 2006 Addenda) and Appendix II. This Technical Position does not apply to testing of the safety function (direction) of check valves included in the Inservice Testing Program.

### Background

The ASME OM Code 2004 through 2006 Addenda section ISTC-3550, "Valves in Regular Use", states:

> "Valves that operate in the course of plant operation at a frequency that would satisfy the exercising requirements of this Subsection need not be additionally exercised, provided that the observations otherwise required for testing are made and analyzed during such operation and recorded in the plant record at intervals no greater than specified in ISTC-3510."

Section ISTC-3510 requires that check valves shall be exercised nominally every 3 months with exceptions (for extended periods) referenced. Section ISTC-5221(a)(2) states:

> "Check valves that have a safety function in only the open direction shall be exercised by initiating flow and observing that the obturator has traveled to either the full open position or to the position required to perform its intended function(s) (see ISTA-1100), and verify closure."

Section ISTC-5221(a)(3) states:

> "Check valves that have a safety function in only the close direction shall be exercised by initiating flow and observing that the obturator has traveled [to] at least the partially open position,[3] and verify that on cessation or reversal of flow, the obturator has traveled to the seat."

**Technical Position TP-01**
(Page 2 of 3)

"[3]The partially open position should correspond to the normal or expected system flow."

Normal and/or expected system flow may vary with plant configuration and alignment. Wolf Creek Nuclear Plant Operations staff is trained in recognizing normal plant conditions. For check valves that have a non-safety function in the open position, Operator judgment has been deemed acceptable in determining whether or not the normal or expected flow rates for plant operation has been obtained. For check valves that have a non-safety related function in the closed position, Operator judgment is also deemed acceptable in determining whether or not flow has occurred at a normal or expected flow rate, in order to cause obturator travel.

**Position**

Wolf Creek Generating Station will verify the non-safety position of check valves included in the Inservice Testing Program using the plant surveillance program. In lieu of a dedicated surveillance to perform the non-safety direction testing, the following alternate verifications may be performed as follows:

1. An appropriate means shall be determined which establishes the method for determining the open/closed non-safety function of the check valve during normal operations. The position determination may be by direct indicator, or by other positive means such as changes in system pressure, flow rate, level, temperature, seat leakage, etc. This determination shall be documented in the respective Condition Monitoring Plan for the specific check valve group. For check valves included in the Inservice Testing Program and not included in the Condition Monitoring Plan, this determination shall be documented in the IST Bases Document for the specific check valve group.

2. Observation and analysis of plant processes that a check valve is satisfying its non-safety direction function may be used. For an example, consider a check valve that has a safety function only in the closed direction and normally provides a flow path to maintain plant operations. If this check valve does not open to pass flow when required, an alarm or indication would identify a problem to the operator. The operator would respond by taking the appropriate actions. A Condition Report would then be generated for the abnormal plant condition which would identify the check valve failure.

3. Observation and analysis of plant logs and other records may be an acceptable method for verifying a check valves non-safety direction function verification during normal plant operations.

**Technical Position TP-01**
(Page 3 of 3)

The open/closed non-safety function shall be recorded at a frequency required by ISTC-3510, nominally every 3 months, (with exceptions as allowed), in plant records such as Wolf Creek Generating Station Operating Logs, Electronic Rounds, chart recorders, automated data loggers, etc. The safety function direction testing requires a Quality Record in the form of a surveillance test. Records as indicated above in 1 through 3 are satisfactory for the non-safety direction testing. A condition action report shall be generated for any issues regarding check valve operability.

**Justification**

This Technical Position establishes the acceptability of the methods used in determining the ability of a valve to satisfy its non-safety function. Through normal plant system operation and Operator actions, a valves non-safety function is verified through either observation or analysis of plant records and logs. Additionally, the recording of parameters which demonstrate valve position is satisfied at a frequency in accordance with ISTC-3510. These actions collectively demonstrate the non-safety position of Inservice Testing Program check valves in regular use as required by ISTC-3550.

**Technical Position TP-02**
(Page 1 of 2)

**Testing of Power Operated Valves with Both Active and Passive Safety Functions**

## Purpose

The purpose of this Technical Position is to establish the testing requirements for power operated valves which have both an active and passive safety function.

## Applicability

This Technical Position is applicable to power operated valves which have an active safety function in one direction while performing a passive safety function in the other direction.

## Background

The IST Program requires valves to be exercised to the position(s) required to fulfill their safety function(s). In addition, valves with remote position indication shall have their position indication verified. The Code does not restrict position indication to active valves.

## Position

Several valves included in the plant are designed to perform passive safety functions during accident conditions, and then based on plant accident response, are designed to change positions to perform another (active) function. Once in their final position, there exist no conditions (for certain valves) in which they would be required to be placed in their original passive position.

These valves are typically emergency core cooling system valves, which require changing position during different phases of the accident. After the original passive safety function (e.g. provide flow path) is performed, the valves are repositioned to perform the active safety function (e.g. provide containment isolation or to allow injection from another water source). These valves are not required to return to their original position.

Power operated valves with passive functions in one direction and active in the other, will be exercised and stroke timed to only their active position. If these valves have position indication, the position indication verification will include verification of both positions.

**Technical Position TP-02**
(Page 2 of 2)

**Justification**

Code Interpretation 01-02 (response to inquiry OMI 99-07) addressed this issue, and is presented below:

Question: If a valve has safety functions in both the open and closed positions and is maintained in one of these positions, but is only required to move from the initial position to the other and is not required to return to the initial position, is stroke timing in both directions required?

Reply: No

**Technical Position TP-03**
(Page 1 of 1)

**Passive Valves Without Test Requirements**

## Purpose

The purpose of this Technical Position is to establish the station position for valves which perform a passive safety function. However, no testing is required in accordance with ISTC.

## Applicability

This Technical Position is applicable to valves that perform a passive function in accordance with ISTC-2000 and do not have inservice testing requirements per Table ISTC-3500-1. This position is typical of Category B, passive valves that do not have position indication.

'An example is a manual valve which must remain in its normal position during an accident, to perform its intended function.'

Typically, manual valves that perform a safety function are locked in their safety position and administratively controlled by Wolf Creek procedures. These valves would be considered passive. If they do not have remote position indicating systems and categorized as B, they would not be subjected to any test requirements in accordance with Table ISTC-3500-1.

## Position

The Wolf Creek Generating Station Inservice Testing Program, Valve Tables - Attachment 15, will not list valves that meet the following criteria.

- The valve is categorized B (seat leakage in the closed position is inconsequential for fulfillment of the valves' required function(s)) in accordance with ISTC-1300.
- The valve is considered passive (valve maintains obturator position and is not required to change obturator position to accomplish the required function(s) in accordance with ISTA-2000.
- The valve does not have a remote position indicating system which detects and indicates valve position.

## Justification

Valves that meet this position will not be listed in the Wolf Creek Generating Station Inservice Testing Program, Valve Tables - Attachment 15, however, the basis for categorization and consideration of active/passive functions shall be documented in the IST Program Basis Document.

**Technical Position TP-04**
(Page 1 of 1)

**Fail Safe Testing of Valves**

## Purpose

The purpose of this Technical Position is to establish the station position for fail safe testing of valves in conjunction with stroke time exercising or position indication testing.

## Applicability

This Technical Position is applicable to valves with fail-safe actuators required to be tested in accordance with ISTC-3560.

## Background

The ASME OM Code 2004 through 2006 Addenda section ISTC-3560 requires; "Valves with fail-safe actuators shall be tested by observing the operation of the actuator upon loss of valve actuating power in accordance with the exercising frequency of ISTC-3510."

Section ISTC-3510 states;

> "Active Category A, Category B, and Category C check valves shall be exercised nominally every 3 months..."

## Position

In cases where the valve operator moves the valve to the open or closed position following de-energizing the operator electrically, by venting air, or both, the resultant valve exercise will satisfy the fail safe test requirements and an additional test specific for fail safe testing will not be performed.

Wolf Creek Generating Station will also use remote position indication as applicable to verify proper fail-safe operation, provided that the indication system for the valve is periodically verified in accordance with ISTC-3700.

## Justification

Fail Safe Testing tests the ability of the fail safe mechanism of the valves to go to its fail safe condition. Whether or not the actuation of this fail safe mechanism is due to Operator Action of failure of either the valves air or electric power source, the resultant action of the valve will be the same. Therefore, the verification of a valve fail safe ability can be taken credit for with the performance of either a stroke time exercising or position indication test.

**Technical Position TP-05**
(Page 1 of 3)

## Classification of Skid Mounted Components

### Purpose

The purpose of this technical position is to clarify requirements for classification of various skid mounted components, and to clarify the testing requirements of these components.

### Background

The ASME Code allows classification of some components as skid mounted when their satisfactory operation is demonstrated by the satisfactory performance of the associated major components. Testing of the major component is sufficient to satisfy Inservice Testing requirements for skid mounted components. In section 3.4 of NUREG 1482 Rev 2, the NRC supports the designation of components as skid mounted:

> "The staff has determined that the testing of the major component is an acceptable means for verifying the operational readiness of the skid-mounted and component subassemblies if the licensee documents this approach in the IST Program. This is acceptable for both Code class components and non-Code class components tested and tracked by the IST Program."

In the 1996a addenda to the ASME OM Code (endorsed by 10CFR50.55(a) in October 2000), the term skid-mounted was clarified by the addition of ISTA paragraph 1.7:

> ISTA 1.7 Definitions
>
> *Skid mounted components and component sub-assemblies* – components integral to or that support operation of major components, even though these components may not be located directly on the skid. In general, these components are supplied by the manufacturer of the major component. Examples include: diesel skid-mounted fuel oil pumps and valves, steam admission and trip throttle valves for high-pressure coolant injection or Auxiliary Feedwater turbine-driven pumps, and solenoid-operated valve provided to control the air-operated valve.

**Technical Position TP-05**
(Page 2 of 3)

This definition was further clarified in later Editions of the OM Code-2004:

ISTA-2000 DEFINITIONS

*Skid mounted pumps and valves* – pumps and valves integral to or that support operation of major components, even though these pumps and valves may not be located directly on the skid. In general, these pumps and valves are supplied by the manufacturer of the major component. Examples include:

(a) diesel fuel oil pumps and valves;
(b) steam admission and trip throttle valves for high-pressure coolant injection pumps;
(c) steam admission and trip throttle valves for Auxiliary Feedwater turbine driven pumps;
(d) solenoid-operated valves provided to control an air-operated valve.

Additionally the Subsections pertaining to pumps (ISTB) and valves (ISTC) includes exclusions/exemptions for skid mounted components;

ISTB-1200(c) Exclusions

Skid-mounted pumps that are tested as part of the major component and are justified by the Owner to be adequately tested.

ISTC-1200 Exemptions

Skid-mounted valves are excluded from this Subsection provided they are tested as part of the major component and are justified by the Owner to be adequately tested.

**Position**

The 2004 ASME OM Code definition of skid mounted will be used for classification of components in the Wolf Creek Generating Station Inservice Testing Program. In addition, for a component to be considered skid mounted:

- The major component associated with the skid mounted component must be surveillance tested at a frequency sufficient to meet ASME Code test frequency for the skid mounted component.
- Satisfactory operation of the skid mounted component must be demonstrated by satisfactory operation of the major component.
- The IST Bases Document should describe the bases for classifying a component as skid mounted, and the IST Program Plan should reference this technical position for the component.

**Technical Position TP-05**
(Page 3 of 3)

**Justification**

Recognition and classification of components as skid mounted eliminates the need for the redundant testing of the sub component(s) as the testing of major (parent) component satisfactory demonstrates operation of the "skid mounted" component(s).

## Technical Position TP-06

**Not Used**

**Technical Position TP-07**
(Page 1 of 2)

**Method for Establishing Acceptance Criteria for Power Operated Valves**

## Purpose

The purpose of this Technical Position is to establish the station position for establishing the stroke time acceptance criteria for power operated valves, including the Limiting Stroke time.

## Applicability

Power Operated Valves Requiring Stroke Time Testing

## Background

The IST Program requires that a valves stroke time reference value be established in accordance with ASME OM Code 2004 through 2006 Addenda section ISTC-3300. In accordance with the definition in ISTA-2000, reference values are defined as follows:

> "one or more values of parameters as measured or determined when the equipment is known to be operating acceptably."

Acceptable ranges are then determined based on these reference values in accordance with ISTC-5114 for Power Operated Relief Valves, ISTC-5132 for Pneumatically Operated Valves, ISTC-5142 for Hydraulically Operated Valves, and ISTC-5152 for Solenoid Operated Valves.

In accordance with the Valve Stroke Testing requirements for the various operator types, the limiting value(s) for full-stroke time of each valve shall be specified by the Owner. Subsection ISTC does not provide specific guidance on determining the limiting value(s). In accordance with NRC Generic Letter 89-04, "Guidance on Developing Acceptable Inservice Testing Programs"

> "...the limiting value should be a reasonable deviation from this reference stroke time based on the valve size, valve type, and actuator type. The deviation should not be so restrictive that it results in a valve being declared inoperable due to reasonable stroke time variations. However, the deviation used to establish the limit should be such that corrective action would be taken for a valve that may not perform its intended function."

When the calculated limiting value for a full-stroke is greater than a Technical Specification (TS) or safety analysis limit, the TS or safety analysis limit should be used as the limiting value of full-stroke time.

**Technical Position TP-07**
(Page 2 of 2)

## Position

Wolf Creek Generating Station will use Table TP-07-1 to establish Acceptable Ranges in accordance with ISTC-5114 for Power Operated Relief Valves, ISTC-5132 for Pneumatically Operated Valves, ISTC-5142 for Hydraulically Operated Valves, and ISTC-5152 for Solenoid Operated Valves. Table TP-07-1 will also be used as general guidance to establish the Limiting Value(s) for power- operated valves. Establishment of Acceptable Ranges and Limiting Value(s) will be as follows:

- $T_{Ref}$ is the reference value in seconds of a valve when it is known to be operating acceptably
  - Reference values may be rounded off to the nearest tenth of a second.
  - Acceptable Ranges may be rounded off to the nearest tenth of a second
- Calculated IST Limiting Values may be rounded off to the nearest whole number. Standard rounding techniques are used when rounding (e.g., 10.45 rounds to 10.5, and 10.44 rounds to 10.4).
- The most conservative limiting value between the IST calculated limit (as determined from Table TP-07-1), UFSAR limit, or Technical Specification limit should be used as the Maximum/Limiting stroke time. Any deviations from this criteria will be evaluated.
- When a valve or its control system has been replace, repaired, or has undergone maintenance[1] that could affect the valve's performance, a new reference value shall be determined or the previous value reconfirmed by an inservice test run before the valve is returned to service, or immediately if the valve had not been removed from service.

**Table TP-07-1**

| Reference Stroke Time | Acceptable Range | Limiting Stroke Time |
|---|---|---|
| $T_{Ref} > 10.0$ | $0.75T_{Ref} - 1.25T_{Ref}$ | $1.50T_{Ref}$ |
| $T_{Ref} \leq 10.0$ | $0.50T_{Ref} - 1.50T_{Ref}$ | $2.00T_{Ref}$ |
| $T_{Ref} < 2.0$ | $\leq 2.0$ | 2.0 |

[1]Examples of maintenance included the adjustment of stem packing, limit switches, or control system valves, as well as either the removal of the bonnet, stem assembly, actuator, obturator, or control system components.

**Technical Position TP-08**
(Page 1 of 2)

## Check Valves in Regular Use

### Purpose

The purpose of this Technical Position is to establish the station position for check valves that are in regular use during normal plant operations.

### Applicability

This Technical Position is applicable to check valves that are capable of being demonstrated to be open during routine operations.

### Background

The ASME OM Code 2004 through 2006 Addenda section ISTC-3550, "Valves in Regular Use", states:

> "Valves that operate in the course of plant operation at a frequency that would satisfy the exercising requirements of this Subsection need not be additionally exercised, provided that the observations otherwise required for testing are made and analyzed during such operation and recorded in the plant record at intervals no greater than specified in ISTC-3510."

Section ISTC-3510 requires that check valves shall be exercised nominally every 3 months with exceptions (for extended periods) referenced.

Normal and/or expected system flow may vary with plant configuration and alignment. The open "safety function" of a check valve typically requires a specified design accident flow rate. For these subject valves, the normal system flow is above the design accident flow rates. Since the Wolf Creek Generating Station Operations staff is trained so as to be able to recognize normal plant conditions, Operator judgment has been deemed acceptable for the purpose of determining check valve open demonstration by observing either normal or expected flow rates for the plant operating condition.

### Position

Wolf Creek Generating Station will verify the open position of these subject check valves by observing plant logs, computer systems, strip chart recorders, etc., during normal plant operations. The open/closed safety function shall be recorded at a frequency required by ISTC-3510, nominally every 3 months, (with exceptions as provided), in plant records such as Wolf Creek Generating Station Operating Logs, Electronic Rounds, chart recorders, automated data loggers, etc.

**Technical Position TP-08**
(Page 2 of 2)

**Justification**

Normal plant systems operation and operator actions provide for the observations and analysis that these subject valves are capable of satisfying their open safety function. Additionally, the recording of parameters which demonstrate valve position is satisfied at a frequency in accordance with ISTC-3510. These actions collectively demonstrate the open safety function of Inservice Testing Program check valves in regular use as required by ISTC-3550.

**Technical Position TP-09**
(Page 1 of 2)

**Categorization of IST Pumps (Group A or B)**

## Position

Wolf Creek Generating Station has categorized the pumps required to be included in the Inservice Testing Program as either Group A or B in accordance with the requirements of ISTB-1300 as defined in ISTB-2000.

Group A pumps are pumps that are operated continuously or routinely during normal operation, cold shutdown, or refueling operations. The following pumps are categorized as Group A pumps at Wolf Creek Nuclear Operating Corporation:

| Pump Number | Class | Group | Type | Function |
|---|---|---|---|---|
| PBG02A | 3 | A | Centrifugal | Boric Acid Transfer |
| PBG02B | 3 | A | Centrifugal | Boric Acid Transfer |
| PEG01A | 3 | A | Centrifugal | Component Cooling |
| PEG01B | 3 | A | Centrifugal | Component Cooling |
| PEG01C | 3 | A | Centrifugal | Component Cooling |
| PEG01D | 3 | A | Centrifugal | Component Cooling |
| PEJ01A | 2 | A | Centrifugal | Residual Heat Removal |
| PEJ01B | 2 | A | Centrifugal | Residual Heat Removal |
| PEC01A | 3 | A | Centrifugal | Fuel Pool Cooling |
| PEC01B | 3 | A | Centrifugal | Fuel Pool Cooling |

Group B pumps are those pumps in standby systems that are not operated routinely except for testing. The following pumps are categorized as Group B pumps at Wolf Creek Nuclear Operating Corporation:

| Pump Number | Class | Group | Type | Function |
|---|---|---|---|---|
| PAL01A | 3 | B | Centrifugal | Auxiliary Feedwater |
| PAL01B | 3 | B | Centrifugal | Auxiliary Feedwater |
| PAL02 | 3 | B | Centrifugal | Auxiliary Feedwater |
| PBG05A | 2 | B | Centrifugal | Charging |
| PBG05B | 2 | B | Centrifugal | Charging |
| PEF01A | 3 | B | Vertical | Essential Service Water |
| PEF01B | 3 | B | Vertical | Essential Service Water |
| PEM01A | 2 | B | Centrifugal | Safety Injection |
| PEM01B | 2 | B | Centrifugal | Safety Injection |
| PEN01A | 2 | B | Centrifugal | Containment Spray |
| PEN01B | 2 | B | Centrifugal | Containment Spray |

**Technical Position TP-09**
(Page 2 of 2)

The following summarizes the Group A, B, and Comprehensive Pump Test requirements as specified by the ASME OM Code Subsection ISTB.

Group A Pump Tests – Group A tests are performed quarterly for each pump categorized as A. The following inservice test parameters are measured for each Group A pump test:

- Speed (if pump is variable speed)
- Differential Pressure
- Discharge Pressure, (for positive displacement pumps)
- Flow Rate
- Vibration

Group B Pump Tests – Group B tests are performed quarterly for each pump categorized as B. The following inservice test parameters are measured for each Group B pump test.

- Speed (if pump is variable speed)
- Differential Pressure[(1)]
- Flow Rate[(1)]

[(1)] For positive displacement pumps, flow rate shall be measured or determined, for all other pumps, differential pressure or flow rate shall be measured or determined.

Comprehensive Pump Tests – Comprehensive pump tests are performed biennially for all pumps in the Inservice Testing Program. The following inservice test parameters are measured for each Comprehensive pump test:

- Speed (if pump is variable speed)
- Differential Pressure
- Discharge Pressure, (for positive displacement pumps)
- Flow Rate - The ISTB Design Flow for the comprehensive pump test is the System's Accident Condition Flow for a single pump
- Vibration

The following instrument accuracy requirements apply to each test type:

| Parameter | Group A | Group B | Comprehensive |
|---|---|---|---|
| Pressure | +/- 2.0% | +/- 2.0% | +/- 0.5% |
| Flow Rate | +/- 2.0% | +/- 2.0% | +/- 2.0% |
| Speed | +/- 2.0% | +/- 2.0% | +/- 2.0% |
| Vibration | +/- 5.0% | +/- 5.0% | +/- 5.0% |
| Differential Pressure | +/- 2.0% | +/- 2.0% | +/- 0.5% |

## Technical Position TP-10
(Page 1 of 3)

## Check Valves Tested Using Disassembly and Examination

### Purpose

The purpose of this Technical Position is to establish the station position for the testing of check valves using disassembly and examination.

### Applicability

This Technical Position is applicable to testing check valves that are included in the Inservice Testing Program, which cannot be tested with flow or backflow using practicable means. This position applies to the following check valves required to be tested in accordance with Subsection ISTC (ASME OM Code 2004 Edition through 2006 Addenda).

| Valve Number | System | Class | Category |
|---|---|---|---|
| ENV0002 | EN | 2 | C |
| ENV0003 | EN | 2 | A/C |
| ENV0004 | EN | 2 | C |
| ENV0008 | EN | 2 | C |
| ENV0009 | EN | 2 | A/C |
| ENV0010 | EN | 2 | C |
| ENV0013 | EN | 2 | C |
| ENV0017 | EN | 2 | C |
| AEV0420 | AE | 2 | C |
| AEV0421 | AE | 2 | C |
| AEV0422 | AE | 2 | C |
| AEV0423 | AE | 2 | C |

### Background

The ASME OM Code 2004 through 2006 Addenda section ISTC-5221(c), states:

> "If the test methods in ISTC-5221(a) and ISTC-5221(b) are impractical for certain check valves, or if sufficient flow cannot be achieved or verified, a sample disassembly examination program shall be used to verify valve obturator movement. If maintenance is performed on one of these valves that could affect its performance, the post maintenance testing shall be conducted in accordance with ISTC-5221(c)(4).
>
> The sample disassembly examination program shall group check valves of similar design, application, and service condition and require a periodic examination of one valve from each group..."

**Technical Position TP-10**
(Page 2 of 3)

(1) Grouping of check valves for the sample disassembly examination program shall be technically justified and shall consider, as a minimum, valve manufacturer, design, service, size, materials of construction, and orientation.

(2) During the disassembly process, the full-stroke motion of the obturator shall be verified. Full-stroke motion of the obturator shall be reverified immediately prior to completing reassembly. Check valves that have their obturator disturbed before full stroke motion is verified shall be examined to determine if a condition exists that could prevent full opening or reclosure of the obturator.

(3) At least one valve from the group shall be disassembled and examined at each refueling outage; all valves in each group shall be disassembled and examined at least once every 8 years

(4) Before return to service, valves that were disassembled for examination or that received maintenance that could affect their performance, shall be exercised full- or part-stroke, if practicable, with flow in accordance with ISTC-3520. Those valves shall also be tested for other requirements (e.g., closure verification or leak rate testing) before returning them to service"

Check valves which fail to meet the full stroke requirements of ISTC-5221(c) shall have corrective actions performed in accordance with ISTC-5224 which states in part:

> "...Check valves in a sample disassembly program that are not capable of full stroke movement (i.e., due to binding) or have failed or have unacceptably degraded internals, shall have the cause of the failure analyzed and the condition corrected. Other check valves in the sample group that may also be affected by this failure mechanism shall be examined or tested during the same refueling outage to determine the condition of internal components and their ability to function.

## Position

Sample Disassembly Examination ENV0002/3/8/9: For valves ENV0002/8, stroke open testing of these valves would require installing temporary piping and flooding the containment recirculation sump with contaminated water. It is not practical to test these valves except during refueling outages, due to the potential radiation exposure and the amount of time necessary to perform this testing would not be allowed by Technical Specification 3.5.2. Valves ENV0003/9 are partial flow tested during associated pump testing and closed/leaked tested each refueling outage. Closed testing of valves ENV0002/8 is impractical due to system design which provides no means to perform reverse flow or leak testing. For all four valves, the minimum full flow is 3615 gpm based on one train being operational during post-LOCA recirc with a Sump temperature of 240 F. It is not practical to achieve this flow without spraying down containment with contaminated water.

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One of these four check valves will be disassembled, inspected, and manually full stroked during each refueling outage in accordance with ASME OM Code ISTC-5221(c). A different valve will be disassembled, inspected, and manually full stroked during each refueling. If the full stroke capability of the disassembled valve is in question, the other valves will be disassembled, inspected and manually full stroked during the same outage per ASME OM Code ISTC-5224.

Sample Disassembly Examination ENV0004/10/13/17:
For ENV0013/17, full stroke open testing of these valves would result in spraying down containment with contaminated water. Closed testing of these valves is impractical due to system design which provides no means to perform reverse flow or leak testing. Valve ENV0004/10 are partial flow tested during their associated quarterly pump test and are full flow tested (3615 gpm) every 2 years. However, close testing of these valves is impractical due to system design which provides no means to perform reverse flow or leak testing. One of these four check valves will be disassembled, inspected, and manually full stroked during each refueling outage in accordance with ASME OM Code ISTC-5221(c). A different valve will be disassembled, inspected, and manually fully stroked during each refueling. If the full stroke capability of the disassembled valve is in question, the other the other three valves will be disassembled, inspected and manually full stroked during the same outage per ASME OM Code ISTC-5224.

Sample Disassembly Examination AEV0420/0421/0422/0423:
For AEV0420/0421/0422/0423, partial flow is documented real time by computer point records. Closed testing of these valves is impractical due to the necessity of providing feedwater flow to the steam generators. Also closure testing of these valves during shutdown due to the drain piping configuration and lack of proper delta pressure does not provide a proper leakage volume for testing the valves. One of these four check valves will be disassembled, inspected, and manually full stroked during each refueling outage in accordance with OM Code ISTC-5221(c). A different valve will be disassembled, inspected, and manually full stroked during each refueling. If the full stroke capability of the disassembled valve is in question, the other three valves will be disassembled, inspected, and manually full stroked during the same outage per OM Code ISTC-5224.

**Justification**

This Technical Position is in compliance with the requirements of the ASME OM Code for disassembly and examination of certain check valves per ISTC-5221(c).

## Technical Position TP-11
(Page 1 of 3)

## Motor Operated Valve OMN-1 Code Case Position

### Purpose

The purpose of this Technical Position is to establish the station position for the testing of motor operated valves which are included in the Inservice Testing Program.

### Applicability

All motor operated valves included in the Wolf Creek Generating Station Inservice Testing Program.

### Background

American Society of Mechanical Engineers (ASME) OM Code 2004 through 2006 Addenda, Subsection ISTC, requires periodic testing of motor operated valves (MOVs).

In lieu of the ASME OM Code ISTC-5120, MOV testing of those valve identified in the IST Program, Wolf Creek Nuclear Operating Corporation will utilize Code Case OMN-1, "Alternative Rules for Preservice and Inservice Testing of Certain Electric Motor-Operated Valve Assemblies in Light Water Reactor Power Plants" for stroke time testing and position indication testing.

The implementation of Code Case OMN-1 will reconcile and consolidate the Wolf Creek MOV testing program developed under Generic Letters (GL) 89-10, "Safety Related Motor Operated Valve Testing and Surveillance," and 96-05, "Periodic Verification of Design Basis Capability of Safety Related Motor Operated Valves," with the IST program and eliminate unnecessary testing that provides minimal information about MOV operational readiness. As part of Wolf Creek's commitment on MOV Periodic Verification Testing made in response to GL 96-05, Wolf Creek is participating in the Joint Owners Group (JOG) Program for MOV Periodic Verification. This program is described in Topical Report MPR-1807, Rev. 2 and endorsed by the NRC in an October 1997 Safety Evaluation.

The Nuclear Regulatory Commission (NRC) in a September 22, 1999 Federal Register Notice (64 FR 51370), issued a Final Rule on 10 CFR Part 50, "Industry Codes and Standards; Amended Requirements." The Federal Register Notice revised, in part, the IST requirements for MOVs. In the final rule, the NRC amended its regulations to incorporate by reference the 1995 Edition and 1996 Addenda of the ASME Code for Operation and Maintenance of Nuclear Power Plants. The final rule also permits the use of alternate rules for IST of MOVs asdescribed in ASME Code Case OMN-1 in lieu of certain provisions of Subsection ISTC.

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The final rule publication noted that the NRC will favorably consider a request by a licensee to apply Code Case OMN-1 for MOVs provided the following commitments are met.

1. The adequacy of the diagnostic test interval for each valve must be evaluated and adjusted as necessary but not later than 5 years or three refueling outages (whichever is longer) from initial implementation of ASME Code Case OMN-1.

2. When extending the exercise test intervals for high risk MOVs beyond a quarterly frequency, licensees shall ensure that the potential increase in core damage frequency and risk associated with the extension is small and consistent with the intent of the Commission's Safety Goal Policy Statement.

3. When implementing Code Case OMN-1, the benefits of performing a particular test should be balanced against the potential adverse effects placed on the valves or systems caused by this testing. For example, potential component (valve or pump) damage or system availability concerns may outweigh benefits of dynamic testing for some MOVs.

**Position**

Wolf Creek Generating Station will use the requirements of Code Case OMN-1 in lieu of MOV stroke time testing and position indication testing. The testing requirements of Code Case OMN-1 have been approved by the NRC for use by licensees provided certain commitments are met. Wolf Creek's implementation and compliance with the above-identified commitments (Items 1-3) of Code Case OMN-1 are detailed below. Exceptions and clarifications to OMN-1 are also provided below.

A. Wolf Creek meets the above-identified commitments (Items 1-3) as follows.

A.1 Wolf Creek evaluates the adequacy of the test interval following each test within the designated surveillance frequency. Since this evaluation is included as part of the surveillance test that determines functional margin, it is impracticable to exceed the maximum interval.

A.2 Wolf Creek will exercise medium and low safety significant MOVs at least once every refuel cycle as required in Code Case OMN-1 Section 3.6.1. Initially, Wolf Creek committed to continue testing high risk MOVs quarterly where practical. (Where it is not practicable to exercise a valve during plant operations, the valve will be exercised in either cold shutdown or in refuel outages per OMN-1 Section 3.6.3.) After sufficient performance data have been obtained and evaluated for medium and low safety significant MOVs exercised at the extended frequency of at least once every refuel cycle, that data will be used in evaluating the same exercise frequency for high risk MOVs. When extending the exercise test intervals for high risk MOVs beyond a quarterly frequency, Wolf Creek shall ensure that the potential increase in core damage frequency and risk associated with the extension is small and consistent with the intent of the Commission's Safety Goal

**Technical Position TP-11**
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Policy Statement. Upon extension of these frequencies, the IST Program will be appropriately revised.

A.3 Wolf Creek Station has performed differential pressure testing practicability reviews for GL 89-10 that evaluated the benefits of performing a particular test against the potential adverse effects placed on the valves or systems caused by this testing. This evaluation included an assessment of potential component (valve or pump) damage or system availability concerns that may outweigh benefits of dynamic testing for some MOVs. As a result, some MOVs are not subject to differential pressure testing, but are justified for design basis performance by static diagnostic testing and analysis.

## Technical Position TP-12
(Page 1 of 2)

## Classification of Check Valves KCV0478 and SJV0111 as Passive

### Purpose

The purpose of this Technical Position is to establish the station position for the classification of certain check valves (KCV0478 and SJV0111) as passive.

### Applicability

This Technical Position is applicable to the following check valves at Wolf Creek:

| Valve Number | System | Class | Category |
|---|---|---|---|
| KCV0478 | KC | 2 | A/C |
| SJV0111 | SJ | 2 | A/C |

### Background

The ASME OM Code 2004 through 2006 Addenda section ISTA-2000 provides a definition of passive valves.

> "*passive valves*: valves that maintain obturator position and are not required to change obturator position to accomplish the required function(s) in shutting down a reactor to a safe shut down condition, maintaining the safe shutdown condition, or mitigating the consequences of an accident.

The Code also provides valve category definitions as follows:

> "Category A – valves for which seat leakage is limited to a specific maximum amount in the closed position for fulfillment of their required function(s), as specified in ISTC-1100."

> "Category C – valves that are self-actuating in response to some system characteristic, such as pressure (relief valves) or flow direction (check valves) for fulfillment of the required function(s), as specified in ISTC-1100."

### Position

Check valve KCV0478 must close to isolate containment from the fire protection system. This valve is considered a containment isolation valve for penetration P-67. This valve is normally closed since the upstream motor operated valve (KCHV0253) is maintained in the closed position. Additionally, manual valve KCV0427 is normally closed to isolate the fire protection to containment piping. Therefore, since this check valve is not required to change positions to perform this function, it is considered passive in the closed position. This valve only opens to allow water from the Fire Protection system to be routed to the containment in event of a fire. This open function is not required for safe shutdown or accident mitigation.

**Technical Position TP-12**
(Page 2 of 2)

Check valve SJV0111 must close to isolate containment from the nuclear sampling system. This valve is required to provide containment isolation for penetration P-57. Flow is blocked by valves SJHV0131&132. Since this valve is not required to change positions to perform this function, it is considered passive in the closed position. The Post Accident Sampling System has been permanently removed from service. Therefore, this valve is not required to open for safe shutdown or accident mitigation. Note that the isolation valves are still required to maintain the safety/non-safety pressure boundary.

Wolf Creek classifies these valves as passive since they are not required to change position to perform their intended function. The subject valves are included in the Wolf Creek Inservice Testing Program as Category A/C, passive check valves. Table 3500-1 of ISTB does not address Category C, Passive valves, therefore Wolf Creek will apply the testing requirements for Category A valves since these have seat leakage test requirements.

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## ATTACHMENT 14

## INSERVICE TESTING PUMP TABLE

| PUMP NUMBER | P&ID NUMBER | P&ID COORD | IST GROUP | ISI CLASS | SPD | DIFF PRESS | FLOW RATE | VIBR TEST | RELIEF REQUEST | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| PAL01A | M-12AL01(Q) | E-4 | B | 3 | N | Y | Y | Y | 4PR-1 | |
| PAL01B | M-12AL01(Q) | H-4 | B | 3 | N | Y | Y | Y | 4PR-1 | |
| PAL02 | M-12AL01(Q) | B-4 | B | 3 | Y | Y | Y | Y | 4PR-1 | |
| PBG02A | M-12BG05(Q) | B-6 | A | 3 | N | Y | Y | Y | 4PR-1 | |
| PBG02B | M-12BG05(Q) | A-6 | A | 3 | N | Y | Y | Y | 4PR-1 | |
| PBG05A | M-12BG03(Q) | C-5 | B | 2 | N | Y | Y | Y | 4PR-2<br>4PR-1 | |
| PBG05B | M-12BG03(Q) | B-5 | B | 2 | N | Y | Y | Y | 4PR-2<br>4PR-1 | |
| PEC01A | M-12EC01 (Q) | G-7 | A | 3 | N | Y | Y | Y | 4PR-1 | |
| PEC01B | M-12EC01 (Q) | E-7 | A | 3 | N | Y | Y | Y | 4PR-1 | |
| PEF01A | M-K2EF01(Q) | F-5 | B | 3 | N | Y | Y | Y | 4PR-1 | |
| PEF01B | M-K2EF01(Q) | C-5 | B | 3 | N | Y | Y | Y | 4PR-1 | |
| PEG01A | M-12EG01(Q) | G-4 | A | 3 | N | Y | Y | Y | 4PR-1 | |
| PEG01B | M-12EG01(Q) | D-4 | A | 3 | N | Y | Y | Y | 4PR-1 | |
| PEG01C | M-12EG01(Q) | E-4 | A | 3 | N | Y | Y | Y | 4PR-1 | |
| PEG01D | M-12EG01(Q) | B-4 | A | 3 | N | Y | Y | Y | 4PR-1 | |
| PEJ01A | M-12EJ01(Q) | G-6 | A | 2 | N | Y | Y | Y | 4PR-1 | |
| PEJ01B | M-12EJ01(Q) | C-6 | A | 2 | N | Y | Y | Y | 4PR-1 | |
| PEM01A | M-12EM01(Q) | E-6 | B | 2 | N | Y | Y | Y | 4PR-1 | |
| PEM01B | M-12EM01(Q) | D-6 | B | 2 | N | Y | Y | Y | 4PR-1 | |
| PEN01A | M-12EN01(Q) | G-6 | B | 2 | N | Y | Y | Y | 4PR-1 | |
| PEN01B | M-12EN01(Q) | B-6 | B | 2 | N | Y | Y | Y | 4PR-1 | |

## ATTACHMENT 15

## INSERVICE TESTING VALVE TABLE

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE /PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ABHV0005 | M-12AB02(Q) | D-4 | 2 | B | 4 | GL | AO | O | Active | | | |
| | | | | | | | | | | BT-O | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| ABHV0006 | M-12AB02(Q) | C-4 | 2 | B | 4 | GL | AO | O | Active | | | |
| | | | | | | | | | | BT-O | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| ABHV0011 | M-12AB02(Q) | H-3 | C | B | 28 | GA | HO | C | Active | | | |
| | | | | | | | | | | BT-C | CS | CSJ-01 |
| | | | | | | | | | | PIT | 2Y | |
| ABHV0012 | M-12ABOV(Q) | G-3 | 2 | B | 2 | GL | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| ABHV0014 | M-12AB02(Q) | F-3 | 2 | B | 28 | GA | HO | C | Active | | | |
| | | | | | | | | | | BT-C | CS | CSJ-01 |
| | | | | | | | | | | PIT | 2Y | |
| ABHV0015 | M-12AB02(Q) | F-3 | 2 | B | 2 | GL | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| ABHV0017 | M-12AB02(Q) | D-3 | 2 | B | 28 | GA | HO | C | Active | | | |
| | | | | | | | | | | BT-C | CS | CSJ-01 |
| | | | | | | | | | | PIT | 2Y | |
| ABHV0018 | M-12AB02(Q) | D-3 | 2 | B | 2 | GL | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| ABHV0020 | M-12AB02(Q) | C-3 | 3 | B | 39 | GA | HO | C | Active | | | |
| | | | | | | | | | | BT-C | CS | CSJ-01 |
| | | | | | | | | | | PIT | 2Y | |
| ABHV0021 | M-12AB02(Q) | C-3 | 2 | B | 2 | GL | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ABHV0048 | M-12AB02(Q) | D-4 | 2 | B | 1 | GL | AO | O | Passive | | | |
| | | | | | | | | | | PIT | 2Y | |
| ABHV0049 | M-12AB02(Q) | C-4 | 2 | B | 1 | GL | AO | O | Passive | | | |
| | | | | | | | | | | PIT | 2Y | |
| ABLV0007 | M-12AB02(Q) | B-4 | 2 | B | 2 | GL | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| ABLV0008 | M-12AB02(Q) | D-5 | 2 | B | 2 | GL | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| ABLV0009 | M-12AB02(Q) | E-4 | 2 | B | 2 | GL | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| ABLV0010 | M-12AB02(Q) | G-4 | 2 | B | 2 | GL | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| ABPSE0001 | M-12AB02(Q) | H-3 | 2 | D | 1 | RPD | SA | O | Active | | | |
| | | | | | | | | | | RPL | 5Y | |
| ABPSE0002 | M-12AB02(Q) | F-3 | 2 | D | 1 | RPD | SA | O | Active | | | |
| | | | | | | | | | | RPL | 5Y | |
| ABPSE0003 | M-12AB02(Q) | E-3 | 2 | D | 1 | RPD | SA | O | Active | | | |
| | | | | | | | | | | RPL | 5Y | |
| ABPSE0004 | M-12AB02(Q) | C-3 | 2 | D | 1 | RPD | SA | O | Active | | | |
| | | | | | | | | | | RPL | 5Y | |
| ABPV0001 | M-12AB01(Q) | G-3 | 2 | B | 8 | GL | AO | O/C | Active | | | |
| | | | | | | | | | | BT-O | Q | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| ABPV0002 | M-12AB01(Q) | D-3 | 2 | B | 8 | GL | AO | O/C | Active | | | |
| | | | | | | | | | | BT-O | Q | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ABPV0003 | M-12AB01(Q) | D-6 | 2 | B | 8 | GL | AO | O/C | Active | | | |
| | | | | | | | | | | BT-O | Q | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| ABPV0004 | M-12AB01(Q) | G-6 | 2 | B | 8 | GL | AO | O/C | Active | | | |
| | | | | | | | | | | BT-O | Q | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| ABV0007 | M-12AB01(Q) | G-6 | 2 | B | 10 | GA | M | O/C | Active | | | |
| | | | | | | | | | | BT-O | 2Y | |
| | | | | | | | | | | BT-C | 2Y | |
| ABV0018 | M-12AB01(Q) | G-3 | 2 | B | 10 | GA | M | O/C | Active | | | |
| | | | | | | | | | | BT-O | 2Y | |
| | | | | | | | | | | BT-C | 2Y | |
| ABV0029 | M-12AB01(Q) | D-6 | 2 | B | 10 | GA | M | O/C | Active | | | |
| | | | | | | | | | | BT-O | 2Y | |
| | | | | | | | | | | BT-C | 2Y | |
| ABV0040 | M-12AB01(Q) | D-3 | 2 | B | 10 | GA | M | O/C | Active | | | |
| | | | | | | | | | | BT-O | 2Y | |
| | | | | | | | | | | BT-C | 2Y | |
| ABV0045 | M-12AB02(Q) | H-7 | 2 | C | 6x8x8 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 5Y | |
| ABV0046 | M-12AB02(Q) | H-7 | 2 | C | 6x8x8 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 5Y | |
| ABV0047 | M-12AB02(Q) | H-6 | 2 | C | 6x8x8 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 5Y | |
| ABV0048 | M-12AB02(Q) | H-5 | 2 | C | 6x8x8 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 5Y | |
| ABV0049 | M-12AB02(Q) | H-5 | 2 | C | 6x8x8 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 5Y | |
| ABV0055 | M-12AB02(Q) | F-7 | 2 | C | 6x8x8 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 5Y | |
| ABV0056 | M-12AB02(Q) | F-7 | 2 | C | 6x8x8 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 5Y | |
| ABV0057 | M-12AB02(Q) | F-6 | 2 | C | 6x8x8 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 5Y | |
| ABV0058 | M-12AB02(Q) | F-5 | 2 | C | 6x8x8 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 5Y | |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ABV0059 | M-12AB02(Q) | F-5 | 2 | C | 6x8x8 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 5Y | |
| ABV0065 | M-12AB02(Q) | E-7 | 2 | C | 6x8x8 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 5Y | |
| ABV0066 | M-12AB02(Q) | E-7 | 2 | C | 6x8x8 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 5Y | |
| ABV0067 | M-12AB02(Q) | E-6 | 2 | C | 6x8x8 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 5Y | |
| ABV0068 | M-12AB02(Q) | E-5 | 2 | C | 6x8x8 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 5Y | |
| ABV0069 | M-12AB02(Q) | E-5 | 2 | C | 6x8x8 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 5Y | |
| ABV0075 | M-12AB02(Q) | C-7 | 2 | C | 6x8x8 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 5Y | |
| ABV0076 | M-12AB02(Q) | C-7 | 2 | C | 6x8x8 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 5Y | |
| ABV0077 | M-12AB02(Q) | C-6 | 2 | C | 6x8x8 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 5Y | |
| ABV0078 | M-12AB02(Q) | C-5 | 2 | C | 6x8x8 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 5Y | |
| ABV0079 | M-12AB02(Q) | C-5 | 2 | C | 6x8x8 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 5Y | |
| ABV0345 | M-12AB01(Q) | H-3 | NC | A/C | 0.75 | CK | SA | C | Active | | | |
| | | | | | | | | | | CVT-O | Q | TP-01 |
| | | | | | | | | | | CVT-C | Q | |
| | | | | | | | | | | AT-3 | 2Y | |
| ABV0346 | M-12AB01(Q) | E-3 | NC | A/C | 0.75 | CK | SA | C | Active | | | |
| | | | | | | | | | | CVT-O | Q | TP-01 |
| | | | | | | | | | | CVT-C | Q | |
| | | | | | | | | | | AT-3 | 2Y | |
| ABV0347 | M-12AB01(Q) | E-5 | NC | A/C | 0.75 | CK | SA | C | Active | | | |
| | | | | | | | | | | CVT-O | Q | TP-01 |
| | | | | | | | | | | CVT-C | Q | |
| | | | | | | | | | | AT-3 | 2Y | |
| ABV0348 | M-12AB01(Q) | H-5 | NC | A/C | 0.75 | CK | SA | C | Active | | | |
| | | | | | | | | | | CVT-O | Q | TP-01 |
| | | | | | | | | | | CVT-C | Q | |
| | | | | | | | | | | AT-3 | 2Y | |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ABV0349 | M-12AB01(Q) | H-3 | NC | C | 0.75 | CK | SA | O | Active | | | |
| | | | | | | | | | | CVT-O | Q | |
| | | | | | | | | | | CVT-C | Q | TP-01 |
| ABV050 | M-12AB01(Q) | E-3 | NC | C | 0.75 | CK | SA | O | Active | | | |
| | | | | | | | | | | CVT-O | Q | |
| | | | | | | | | | | CVT-C | Q | TP-01 |
| ABV0351 | M-12AB01(Q) | E-5 | NC | C | 0.75 | CK | SA | O | Active | | | |
| | | | | | | | | | | CVT-O | Q | |
| | | | | | | | | | | CVT-C | Q | TP-01 |
| ABV0352 | M-12AB01(Q) | E-7 | NC | C | 0.75 | CK | SA | O | Active | | | |
| | | | | | | | | | | CVT-O | Q | |
| | | | | | | | | | | CVT-C | Q | TP-01 |
| AEFCV0510 | M-12AE01(Q) | E-7 | 3 | B | 14 | GL | AO | C | Active | | | |
| | | | | | | | | | | BT-C | CS | CSJ-15 |
| | | | | | | | | | | FST | CS | CSJ-15, TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| AEFCV0520 | M-12AE01(Q) | D-7 | 3 | B | 14 | GL | AO | C | Active | | | |
| | | | | | | | | | | BT-C | CS | CSJ-15 |
| | | | | | | | | | | FST | CS | CSJ-15, TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| AEFCV0530 | M-12AE01(Q) | B-7 | 3 | B | 14 | GL | AO | C | Active | | | |
| | | | | | | | | | | BT-C | CS | CSJ-15 |
| | | | | | | | | | | FST | CS | CSJ-15, TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| AEFCV0540 | M-12AE01(Q) | G-7 | 3 | B | 14 | GL | AO | C | Active | | | |
| | | | | | | | | | | BT-C | CS | CSJ-15 |
| | | | | | | | | | | FST | CS | CSJ-15, TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| AEFCV0550 | M-12AE01(Q) | E-7 | 3 | B | 14 | GL | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| AEFCV0560 | M-12AE01(Q) | C-7 | 3 | B | 14 | GL | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| AEFCV0570 | M-12AE01(Q) | B-7 | 3 | B | 14 | GL | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AEFCV0580 | M-12AE01(Q) | G-7 | 3 | B | 14 | GL | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| AEFV0039 | M-12AE02(Q) | G-3 | 2 | B | 14 | GA | HO | C | Active | | | |
| | | | | | | | | | | BT-C | CS | CSJ-02 |
| | | | | | | | | | | FST | CS | CSJ-02, TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| AEFV0040 | M-12AE02(Q) | C-3 | 2 | B | 14 | GA | HO | C | Active | | | |
| | | | | | | | | | | BT-C | CS | CSJ-02 |
| | | | | | | | | | | FST | CS | CSJ-02, TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| AEFV0041 | M-12AE02(Q) | C-6 | 2 | B | 14 | GA | HO | C | Active | | | |
| | | | | | | | | | | BT-C | CS | CSJ-02 |
| | | | | | | | | | | FST | CS | CSJ-02, TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| AEFV0042 | M-12AE02(Q) | G-6 | 2 | B | 14 | GA | HO | C | Active | | | |
| | | | | | | | | | | BT-C | CS | CSJ-02 |
| | | | | | | | | | | FST | CS | CSJ-02, TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| AEFV0043 | M-12AE02(Q) | G-4 | 2 | B | 14 | GA | HO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| AEFV0044 | M-12AE02(Q) | D-4 | 2 | B | 14 | GA | HO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| AEFV0045 | M-12AE02(Q) | D-7 | 2 | B | 14 | GA | HO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| AEFV0046 | M-12AE02(Q) | G-7 | 2 | B | 14 | GA | HO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| AEPSE0001 | M-12AE02(Q) | H-3 | 2 | D | 1 | RPD | SA | O | Active | | | |
| | | | | | | | | | | RPL | 5Y | |
| AEPSE0002 | M-12AE02(Q) | D-3 | 2 | D | 1 | RPD | SA | O | Active | | | |
| | | | | | | | | | | RPL | 5Y | |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AEPSE0003 | M-12AE02(Q) | D-3 | 2 | D | 1 | RPD | SA | O | Active | | | |
| | | | | | | | | | | RPL | 5Y | |
| AEPSE0004 | M-12AE02(Q) | H-6 | 2 | D | 1 | RPD | SA | O | Active | | | |
| | | | | | | | | | | RPL | 5Y | |
| AEV0124 | M-12AE02(Q) | C-3 | 2 | C | 4 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | CS | CSJ-04 |
| | | | | | | | | | | CVT-C | CS | CSJ-04 |
| AEV0125 | M-12AE02(Q) | F-3 | 2 | C | 4 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | CS | CSJ-04 |
| | | | | | | | | | | CVT-C | CS | CSJ-04 |
| AEV0126 | M-12AE02(Q) | F-6 | 2 | C | 4 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | CS | CSJ-04 |
| | | | | | | | | | | CVT-C | CS | CSJ-04 |
| AEV0127 | M-12AE02(Q) | C-6 | 2 | C | 4 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | CS | CSJ-04 |
| | | | | | | | | | | CVT-C | CS | CSJ-04 |
| AEV0420 | M-12AE02(Q) | C-3 | 2 | C | 14 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | Q | |
| | | | | | | | | | | CVT-C | SDE | TP-10 |
| AEV0421 | M-12AE02(Q) | F-3 | 2 | C | 14 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | Q | |
| | | | | | | | | | | CVT-C | SDE | TP-10 |
| AEV0422 | M-12AE02(Q) | F-6 | 2 | C | 14 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | Q | |
| | | | | | | | | | | CVT-C | SDE | TP-10 |
| AEV0423 | M-12AE02(Q) | C-6 | 2 | C | 14 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | Q | |
| | | | | | | | | | | CVT-C | SDE | TP-10 |
| ALHV0005 | M-12AL01(Q) | H-7 | 2 | B | 4 | GL | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| ALHV0006 | M-12AL01(Q) | G-7 | 2 | B | 4 | GL | AO | O/C | Active | | | |
| | | | | | | | | | | BT-C | Q | TP-02 |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| ALHV0007 | M-12AL01(Q) | F-7 | 2 | B | 4 | GL | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ALHV0008 | M-12AL01(Q) | E-7 | 2 | B | 4 | GL | AO | O/C | Active | | | |
| | | | | | | | | | | BT-C | Q | TP-02 |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| ALHV0009 | M-12AL01(Q) | E-7 | 2 | B | 4 | GL | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| ALHV0010 | M-12AL01(Q) | D-7 | 2 | B | 4 | GL | AO | O/C | Active | | | |
| | | | | | | | | | | BT-C | Q | TP-02 |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| ALHV0011 | M-12AL01(Q) | C-7 | 2 | B | 4 | GL | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| ALHV0012 | M-12AL01(Q) | B-7 | 2 | B | 4 | GL | AO | O/C | Active | | | |
| | | | | | | | | | | BT-C | Q | TP-02 |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| ALHV0030 | M-12AL01(Q) | F-3 | 3 | B | 6 | BTF | MO | O | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| ALHV0031 | M-12AL01(Q) | E-3 | 3 | B | 6 | BTF | MO | O | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| ALHV0032 | M-12AL01(Q) | C-3 | 3 | B | 6 | BTF | MO | O | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| ALHV0033 | M-12AL01(Q) | B-3 | 3 | B | 6 | BTF | MO | O | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| ALHV0034 | M-12AL01(Q) | H-4 | 3 | B | 8 | GA | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| ALHV0035 | M-12AL01(Q) | D-4 | 3 | B | 8 | GA | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ALHV0036 | M-12AL01(Q) | B-4 | 3 | B | 8 | GA | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| ALPSE0001 | M-12AL01(Q) | A7 | 3 | D | 3 | RPD | SA | O | Active | | | |
| | | | | | | | | | | RPL | 5Y | |
| ALPSE0002 | M-12AL01(Q) | A-7 | 3 | D | 3 | RPD | SA | O | Active | | | |
| | | | | | | | | | | RPL | 5Y | |
| ALV0001 | M-12AL01(Q) | B-4 | 3 | C | 10 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-11 |
| | | | | | | | | | | CVT-C | CM | CVCM-11 |
| ALV0002 | M-12AL01(Q) | D-4 | 3 | C | 8 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | Q | |
| | | | | | | | | | | CVT-C | Q | |
| ALV0003 | M-12AL01(Q) | H-4 | 3 | C | 8 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | Q | |
| | | | | | | | | | | CVT-C | Q | |
| ALV0006 | M-12AL01(Q) | F-4 | 3 | C | 6 | CK | SA | O | Active | | | |
| | | | | | | | | | | CVT-O | Q | |
| | | | | | | | | | | CVT-C | Q | TP-01 |
| ALV0009 | M-12AL01(Q) | E-4 | 3 | C | 6 | CK | SA | O | Active | | | |
| | | | | | | | | | | CVT-O | Q | |
| | | | | | | | | | | CVT-C | Q | TP-01 |
| ALV0012 | M-12AL01(Q) | C-4 | 3 | C | 8 | CK | SA | O | Active | | | |
| | | | | | | | | | | CVT-O | Q | |
| | | | | | | | | | | CVT-C | Q | TP-01 |
| ALV0015 | M-12AL01(Q) | B-4 | 3 | C | 8 | CK | SA | O | Active | | | |
| | | | | | | | | | | CVT-O | Q | |
| | | | | | | | | | | CVT-C | Q | TP-01 |
| ALV0030 | M-12AL01(Q) | H-6 | 3 | C | 6 | CK | SA | O | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-11 |
| | | | | | | | | | | CVT-C | CM | CVCM-11 |
| ALV0033 | M-12AL01(Q) | F-7 | 2 | C | 4 | CK | SA | O | Active | | | |
| | | | | | | | | | | CVT-O | CS | CSJ-05 |
| | | | | | | | | | | CVT-C | 1.5Y | TP-01 |
| ALV0036 | M-12AL01(Q) | H-7 | 2 | C | 4 | CK | SA | O | Active | | | |
| | | | | | | | | | | CVT-O | CS | CSJ-05 |
| | | | | | | | | | | CVT-C | 1.5Y | TP-01 |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ALV0042 | M-12AL01(Q) | D-5 | 3 | C | 6 | CK | SA | O | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-11 |
| | | | | | | | | | | CVT-C | CM | CVCM-11 |
| ALV0045 | M-12AL01(Q) | C-7 | 3 | C | 6 | CK | SA | O | Active | | | |
| | | | | | | | | | | CVT-O | CS | CSJ-05 |
| | | | | | | | | | | CVT-C | 1.5Y | TP-01 |
| ALV0048 | M-12AL01(Q) | D-7 | 3 | C | 6 | CK | SA | O | Active | | | |
| | | | | | | | | | | CVT-O | CS | CSJ-05 |
| | | | | | | | | | | CVT-C | 1.5Y | TP-01 |
| ALV0054 | M-12AL01(Q) | B-5 | 3 | C | 8 | CK | SA | O | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-11 |
| | | | | | | | | | | CVT-C | CM | CVCM-11 |
| ALV0057 | M-12AL01(Q) | E-7 | 2 | C | 4 | CK | SA | O | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-11 |
| | | | | | | | | | | CVT-C | CM | CVCM-11 |
| ALV0062 | M-12AL01(Q) | G-7 | 2 | C | 4 | CK | SA | O | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-11 |
| | | | | | | | | | | CVT-C | CM | CVCM-11 |
| ALV0067 | M-12AL01(Q) | D-7 | 2 | C | 4 | CK | SA | O | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-11 |
| | | | | | | | | | | CVT-C | CM | CVCM-11 |
| ALV0072 | M-12AL01(Q) | B-7 | 2 | C | 4 | CK | SA | O | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-11 |
| | | | | | | | | | | CVT-C | CM | CVCM-11 |
| ALV0149 | M-12AL01(Q) | G-6 | 3 | A/C | | CK | SA | C | Active | | | |
| | | | | | | | | | | CVT-O | Q | TP-01 |
| | | | | | | | | | | CVT-C | Q | |
| | | | | | | | | | | AT-3 | 2Y | |
| ALV0150 | M-12AL01(Q) | F-6 | 3 | A/C | | CK | SA | C | Active | | | |
| | | | | | | | | | | CVT-O | Q | TP-01 |
| | | | | | | | | | | CVT-C | Q | |
| | | | | | | | | | | AT-3 | 2Y | |
| ALV0151 | M-12AL01(Q) | D-6 | 3 | A/C | | CK | SA | C | Active | | | |
| | | | | | | | | | | CVT-O | Q | TP-01 |
| | | | | | | | | | | CVT-C | Q | |
| | | | | | | | | | | AT-3 | 2Y | |
| ALV0152 | M-12AL01(Q) | B-6 | 3 | A/C | | CK | SA | C | Active | | | |
| | | | | | | | | | | CVT-O | Q | TP-01 |
| | | | | | | | | | | CVT-C | Q | |
| | | | | | | | | | | AT-3 | 2Y | |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ALV0153 | M-12AL01(Q) | G-6 | 3 | C | | CK | SA | C | Active | | | |
| | | | | | | | | | | CVT-O | Q | TP-01 |
| | | | | | | | | | | CVT-C | Q | |
| ALV0154 | M-12AL01(Q) | G-6 | 3 | C | | CK | SA | C | Active | | | |
| | | | | | | | | | | CVT-O | Q | TP-01 |
| | | | | | | | | | | CVT-C | Q | |
| ALV0155 | M-12AL01(Q) | G-6 | 3 | C | | CK | SA | C | Active | | | |
| | | | | | | | | | | CVT-O | Q | TP-01 |
| | | | | | | | | | | CVT-C | Q | |
| ALV0156 | M-12AL01(Q) | G-6 | 3 | C | | CK | SA | C | Active | | | |
| | | | | | | | | | | CVT-O | Q | TP-01 |
| | | | | | | | | | | CVT-C | Q | |
| ALV0161 | M-12AL01(Q) | B-3 | 3 | C | 10 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-11 |
| | | | | | | | | | | CVT-C | CM | CVCM-11 |
| ALV0167 | M-12AL01(Q) | A-3 | 3 | C | 4 | CK | SA | C | Active | | | |
| | | | | | | | | | | CVT-O | Q | |
| | | | | | | | | | | CVT-C | Q | |
| BB8010A | M-12BB02(Q) | G-7 | 1 | C | 6 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 5Y | |
| | | | | | | | | | | PIT | 5Y | |
| BB8010B | M-12BB02(Q) | G-6 | 1 | C | 6 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 5Y | |
| | | | | | | | | | | PIT | 5Y | |
| BB8010C | M-12BB02(Q) | G-5 | 1 | C | 6 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 5Y | |
| | | | | | | | | | | PIT | 5Y | |
| BB8378A | M-12BB01(Q) | E-4 | 1 | C | 3 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | RR | RJ-02, TP-01 |
| | | | | | | | | | | CVT-C | RR | RJ-02 |
| BB8378B | M-12BB01(Q) | E-4 | 1 | C | 3 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | RR | RJ-02, TP-01 |
| | | | | | | | | | | CVT-C | RR | RJ-02 |
| BB8379A | M-12BB01(Q) | E-6 | 1 | C | 3 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | RR | RJ-02, TP-01 |
| | | | | | | | | | | CVT-C | RR | RJ-02 |
| BB8379B | M-12BB01(Q) | E-6 | 1 | C | 3 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | RR | RJ-02, TP-01 |
| | | | | | | | | | | CVT-C | RR | RJ-02 |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BB8948A | M-12BB01(Q) | E-4 | 1 | A/C | 10 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-14 |
| | | | | | | | | | | CVT-C | CM | CVCM-14 |
| | | | | | | | | | | AT-2 | 1.5Y | CVCM-14 |
| BB8948B | M-12BB01(Q) | D-4 | 1 | A/C | 10 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-14 |
| | | | | | | | | | | CVT-C | CM | CVCM-14 |
| | | | | | | | | | | AT-2 | 1.5Y | CVCM-14 |
| BB8948C | M-12BB01(Q) | D-6 | 1 | A/C | 10 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-14 |
| | | | | | | | | | | CVT-C | CM | CVCM-14 |
| | | | | | | | | | | AT-2 | 1.5Y | CVCM-14 |
| BB8948D | M-12BB01(Q) | E-6 | 1 | A/C | 10 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-14 |
| | | | | | | | | | | CVT-C | CM | CVCM-14 |
| | | | | | | | | | | AT-2 | 1.5Y | CVCM-14 |
| BB8949A | M-12BB01(Q) | E-5 | 1 | A/C | 10 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-04 |
| | | | | | | | | | | CVT-C | CM | CVCM-04 |
| | | | | | | | | | | AT-2 | 1.5Y | CVCM-04 |
| BB8949B | M-12BB01(Q) | D-5 | 1 | A/C | 10 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-04 |
| | | | | | | | | | | CVT-C | CM | CVCM-04 |
| | | | | | | | | | | AT-2 | 1.5Y | CVCM-04 |
| BB8949C | M-12BB01(Q) | C-5 | 1 | A/C | 10 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-04 |
| | | | | | | | | | | CVT-C | CM | CVCM-04 |
| | | | | | | | | | | AT-2 | 1.5Y | CVCM-04 |
| BB8949D | M-12BB01(Q) | G-6 | 1 | A/C | 10 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-04 |
| | | | | | | | | | | CVT-C | CM | CVCM-04 |
| | | | | | | | | | | AT-2 | 1.5Y | CVCM-04 |
| BBHV0013 | M-12BB03(Q) | C-2 | 3 | B | 3 | GA | MO | C | Active | | | |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| BBHV0014 | M-12BB03(Q) | C-2 | 3 | B | 3 | GA | MO | C | Active | | | |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| BBHV0015 | M-12BB03(Q) | C-2 | 3 | B | 3 | GA | MO | C | Active | | | |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BBHV0016 | M-12BB03(Q) | C-2 | 3 | B | 3 | GA | MO | C | Active | | | |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| BBHV8000A | M-12BB02(Q) | E-7 | 1 | B | 3 | GA | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | Q | TP-11 |
| BBHV8000B | M-12BB02(Q) | E-7 | 1 | B | 3 | GA | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | Q | TP-11 |
| BBHV8001A | M-12BB04(Q) | F-4 | 2 | B | 1 | GL | SO | O/C | Active | | | |
| | | | | | | | | | | BT-O | RR | RJ-10 |
| | | | | | | | | | | BT-C | RR | RJ-10 |
| | | | | | | | | | | FST | RR | RJ-10, TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| BBHV8001B | M-12BB04(Q) | F-4 | 2 | B | 1 | GL | SO | O/C | Active | | | |
| | | | | | | | | | | BT-O | RR | RJ-10 |
| | | | | | | | | | | BT-C | RR | RJ-10 |
| | | | | | | | | | | FST | RR | RJ-10, TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| BBHV8002A | M-12BB04(Q) | F-3 | 2 | B | 1 | GL | SO | O/C | Active | | | |
| | | | | | | | | | | BT-O | RR | RJ-10 |
| | | | | | | | | | | BT-C | RR | RJ-10 |
| | | | | | | | | | | FST | RR | RJ-10, TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| BBHV8002B | M-12BB04(Q) | F-3 | 2 | B | 1 | GL | SO | O/C | Active | | | |
| | | | | | | | | | | BT-O | RR | RJ-10 |
| | | | | | | | | | | BT-C | RR | RJ-10 |
| | | | | | | | | | | FST | RR | RJ-10, TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| BBHV8026 | M-12BB02(Q) | E-3 | 2 | A | 1 | DIA | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| | | | | | | | | | | AT-1 | App J | |
| BBHV8027 | M-12BB02(Q) | E-4 | 2 | A | 1 | DIA | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| | | | | | | | | | | AT-1 | App J | |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BBHV8157A | M-12BB02(Q) | E-2 | 2 | B | 1 | GL | MO | O | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| BBHV8157B | M-12BB02(Q) | E-2 | 2 | B | 1 | GL | MO | O | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| BBHV8351A | M-12BB03(Q) | C-5 | 2 | A | 2 | GL | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | AT-1 | App J | |
| | | | | | | | | | | BT-E | RC | TP-11 |
| BBHV8351B | M-12BB03(Q) | C-5 | 2 | A | 2 | GL | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | AT-1 | App J | |
| | | | | | | | | | | BT-E | RC | TP-11 |
| BBHV8351C | M-12BB03(Q) | C-5 | 2 | A | 2 | GL | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | AT-1 | App J | |
| | | | | | | | | | | BT-E | RC | TP-11 |
| BBHV8351D | M-12BB03(Q) | C-5 | 2 | A | 2 | GL | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | AT-1 | App J | |
| | | | | | | | | | | BT-E | RC | TP-11 |
| BBPCV0455A | M-12BB02(Q) | E-7 | 1 | B | 3 | GL | SO | O/C | Active | | | |
| | | | | | | | | | | BT-O | CS | CSJ-07 |
| | | | | | | | | | | BT-C | CS | CSJ-07 |
| | | | | | | | | | | FST | CS | CSJ-07, TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| BBPCV0456A | M-12BB02(Q) | E-8 | 1 | B | 3 | GL | SO | O/C | Active | | | |
| | | | | | | | | | | BT-O | CS | CSJ-07 |
| | | | | | | | | | | BT-C | CS | CSJ-07 |
| | | | | | | | | | | FST | CS | CSJ-07, TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| BBPV8702A | M-12BB01(Q) | E-4 | 1 | A | 12 | GA | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | AT-4 | 1.5Y | |
| | | | | | | | | | | BT-E | RC | TP-11 |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BBPV8702B | M-12BB01(Q) | H-5 | 1 | A | 12 | GA | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | AT-4 | 1.5Y | |
| | | | | | | | | | | BT-E | RC | TP-11 |
| BBV0001 | M-12BB01(Q) | D-5 | 1 | A/C | 1.5 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | RR | RJ-01 |
| | | | | | | | | | | CVT-C | RR | RJ-01 |
| | | | | | | | | | | AT-2 | 1.5Y | |
| BBV0022 | M-12BB01(Q) | D-4 | 1 | A/C | 1.5 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | RR | RJ-01 |
| | | | | | | | | | | CVT-C | RR | RJ-01 |
| | | | | | | | | | | AT-2 | 1.5Y | |
| BBV0040 | M-12BB01(Q) | D-6 | 1 | A/C | 1.5 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | RR | RJ-01 |
| | | | | | | | | | | CVT-C | RR | RJ-01 |
| | | | | | | | | | | AT-2 | 1.5Y | |
| BBV0059 | M-12BB01(Q) | E-6 | 1 | A/C | 1.5 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | RR | RJ-01 |
| | | | | | | | | | | CVT-C | RR | RJ-01 |
| | | | | | | | | | | AT-2 | 1.5Y | |
| BBV0118 | M-12BB03(Q) | C-5 | 2 | A/C | 2 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-02 |
| | | | | | | | | | | CVT-C | CM | CVCM-02 |
| | | | | | | | | | | AT-1 | App J | |
| BBV0120 | M-12BB03(Q) | C-4 | 1 | C | 2 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | RR | RJ-11 |
| | | | | | | | | | | CVT-C | RR | RJ-11 |
| BBV0121 | M-12BB03(Q) | C-4 | 1 | C | 2 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | RR | RJ-11 |
| | | | | | | | | | | CVT-C | RR | RJ-11 |
| BBV0148 | M-12BB03(Q) | C-5 | 2 | A/C | 2 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-02 |
| | | | | | | | | | | CVT-C | CM | CVCM-02 |
| | | | | | | | | | | AT-1 | App J | |
| BBV0150 | M-12BB03(Q) | C-4 | 1 | C | 2 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | RR | RJ-11 |
| | | | | | | | | | | CVT-C | RR | RJ-11 |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BBV0151 | M-12BB03(Q) | C-4 | 1 | C | 2 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | RR | RJ-11 |
| | | | | | | | | | | CVT-C | RR | RJ-11 |
| BBV0178 | M-12BB03(Q) | C-5 | 2 | A/C | 2 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-02 |
| | | | | | | | | | | CVT-C | CM | CVCM-02 |
| | | | | | | | | | | AT-1 | App J | |
| BBV0180 | M-12BB03(Q) | C-4 | 1 | C | 2 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | RR | RJ-11 |
| | | | | | | | | | | CVT-C | RR | RJ-11 |
| BBV0181 | M-12BB03(Q) | C-4 | 1 | C | 2 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | RR | RJ-11 |
| | | | | | | | | | | CVT-C | RR | RJ-11 |
| BBV0208 | M-12BB03(Q) | C-5 | 2 | A/C | 2 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-02 |
| | | | | | | | | | | CVT-C | CM | CVCM-02 |
| | | | | | | | | | | AT-1 | App J | |
| BBV0210 | M-12BB03(Q) | C-4 | 1 | C | 2 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | RR | RJ-11 |
| | | | | | | | | | | CVT-C | RR | RJ-11 |
| BBV0211 | M-12BB03(Q) | C-4 | 1 | C | 2 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | RR | RJ-11 |
| | | | | | | | | | | CVT-C | RR | RJ-11 |
| BBV0443 | M-12BB03(Q) | C-5 | 3 | C | 1.5 | CK | SA | C | Active | | | |
| | | | | | | | | | | CVT-O | Q | TP-08 |
| | | | | | | | | | | CVT-C | RR | RJ-12 |
| BBV0444 | M-12BB03(Q) | C-5 | 3 | C | 1.5 | CK | SA | C | Active | | | |
| | | | | | | | | | | CVT-O | Q | TP-08 |
| | | | | | | | | | | CVT-C | RR | RJ-12 |
| BBV0445 | M-12BB03(Q) | E-6 | 3 | C | 1.5 | CK | SA | C | Active | | | |
| | | | | | | | | | | CVT-O | Q | TP-08 |
| | | | | | | | | | | CVT-C | RR | RJ-12 |
| BBV0446 | M-12BB03(Q) | E-6 | 3 | C | 1.5 | CK | SA | C | Active | | | |
| | | | | | | | | | | CVT-O | Q | TP-08 |
| | | | | | | | | | | CVT-C | RR | RJ-12 |
| BBV0447 | M-12BB03(Q) | E-6 | 3 | C | 1.5 | CK | SA | C | Active | | | |
| | | | | | | | | | | CVT-O | Q | TP-01, TP-08 |
| | | | | | | | | | | CVT-C | RR | RJ-12 |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BBV0448 | M-12BB03(Q) | E-6 | 3 | C | 1.5 | CK | SA | C | Active | | | |
| | | | | | | | | | | CVT-O | Q | TP-01, TP-08 |
| | | | | | | | | | | CVT-C | RR | RJ-12 |
| BBV0449 | M-12BB03(Q) | E-6 | 3 | C | 1.5 | CK | SA | C | Active | | | |
| | | | | | | | | | | CVT-O | Q | TP-01, TP-08 |
| | | | | | | | | | | CVT-C | RR | RJ-12 |
| BBV0450 | M-12BB03(Q) | E-6 | 3 | C | 1.5 | CK | SA | C | Active | | | |
| | | | | | | | | | | CVT-O | Q | TP-01, TP-08 |
| | | | | | | | | | | CVT-C | RR | RJ-12 |
| BG8121 | M-12BG01(Q) | D-3 | 2 | C | 2x3 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 10Y | |
| BG8123 | M-12BG01(Q) | H-4 | 2 | C | 2x3 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 10Y | |
| BG8124 | M-12BG01(Q) | C-7 | 2 | C | 2x3 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 10Y | |
| BG8381 | M-12BG01(Q) | F-4 | 2 | A/C | 3 | CK | SA | C | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-02 |
| | | | | | | | | | | CVT-C | CM | CVCM-02 |
| | | | | | | | | | | AT-1 | App J | |
| BG8440 | M-12BG03(Q) | E-6 | 2 | C | 4 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | Q | |
| | | | | | | | | | | CVT-C | RR | RJ-03 |
| BG8481A | M-12BG03(Q) | C-4 | 2 | C | 4 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | RR | RJ-04 |
| | | | | | | | | | | CVT-C | CS | |
| BG8481B | M-12BG03(Q) | B-4 | 2 | C | 4 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | RR | RJ-04 |
| | | | | | | | | | | CVT-C | CS | |
| BG8497 | M-12BG03(Q) | D-4 | 2 | C | 3 | CK | SA | C | Active | | | |
| | | | | | | | | | | CVT-O | Q | TP-01, TP-08 |
| | | | | | | | | | | CVT-C | Q | |
| BG8546A | M-12BG03(Q) | C-7 | 2 | A/C | 8 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | RR | RJ-05 |
| | | | | | | | | | | CVT-C | RR | RJ-05 |
| | | | | | | | | | | AT-4 | 2Y | |
| BG8546B | M-12BG03(Q) | B-7 | 2 | A/C | 8 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | RR | RJ-05 |
| | | | | | | | | | | CVT-C | RR | RJ-05 |
| | | | | | | | | | | AT-4 | 2Y | |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BGHV8100 | M-12BG01(Q) | D-2 | 2 | A | 2 | GL | MO | C | Active | | | |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | AT-1 | App J | |
| | | | | | | | | | | BT-E | RC | TP-11 |
| BGHV8104 | M-12BG05(Q) | A-4 | 2 | B | 2 | GL | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| BGHV8105 | M-12BG01(Q) | D-2 | 2 | A | 2 | GL | MO | C | Active | | | |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | AT-1 | App J | |
| | | | | | | | | | | BT-E | RC | TP-11 |
| BGHV8106 | M-12BG03(Q) | D-2 | 2 | B | 3 | GA | MO | C | Active | | | |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| BGHV8110 | M-12BG03(Q) | E-4 | 2 | B | 2 | GL | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| BGHV8111 | M-12BG03(Q) | E-4 | 2 | B | 2 | GL | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| BGHV8112 | M-12BG01(Q) | D-2 | 2 | A | 2 | GL | MO | C | Active | | | |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | AT-1 | App J | |
| | | | | | | | | | | BT-E | RC | TP-11 |
| | | | | | | | | | | PIT | 2Y | |
| BGHV8152 | M-12BG01(Q) | G-3 | 2 | A | 3 | GL | AO | C | Active | | | |
| | | | | | | | | | | BT-C | CS | CSJ-10 |
| | | | | | | | | | | FST | CS | CSJ-10, TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| | | | | | | | | | | AT-1 | App J | |
| BGHV8153A | M-12BG01(Q) | D-7 | 1 | B | 1 | GL | SO | O/C | Active | | | |
| | | | | | | | | | | BT-O | Q | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BGHV8153B | M-12BG01(Q) | D-7 | 1 | B | 1 | GL | SO | O/C | Active | | | |
| | | | | | | | | | | BT-O | Q | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| BGHV8154A | M-12BG01(Q) | D-8 | 1 | B | 1 | GL | SO | O/C | Active | | | |
| | | | | | | | | | | BT-O | Q | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| BGHV8154B | M-12BG01(Q) | D-8 | 1 | B | 1 | GL | SO | O/C | Active | | | |
| | | | | | | | | | | BT-O | Q | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| BGHV8160 | M-12BG01(Q) | F-3 | 2 | A | 3 | GL | SO | C | Active | | | |
| | | | | | | | | | | BT-C | CS | CSJ-10 |
| | | | | | | | | | | FST | CS | CSJ-10, TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| | | | | | | | | | | AT-1 | App J | |
| BGHV8357A | M-12BG03(Q) | C-4 | 2 | B | 1 | GL | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| BGHV8357B | M-12BG03(Q) | B-4 | 2 | B | 1 | GL | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| BGLCV0112B | M-12BG03(Q) | F-6 | 2 | B | 4 | GA | MO | C | Active | | | |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| BGLCV0112C | M-12BG03(Q) | F-6 | 2 | B | 4 | GA | MO | C | Active | | | |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| BGLCV0459 | M-12BG01(Q) | H-7 | 1 | B | 3 | GL | AO | C | Active | | | |
| | | | | | | | | | | BT-C | CS | CSJ-11 |
| | | | | | | | | | | FST | CS | CSJ-11, TP-04 |
| | | | | | | | | | | PIT | 2Y | |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BGLCV0460 | M-12BG01(Q) | H-7 | 1 | B | 3 | GL | AO | C | Active | | | |
| | | | | | | | | | | BT-C | CS | CSJ-11 |
| | | | | | | | | | | FST | CS | CSJ-11, TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| BGV0091 | M-12BG03(Q) | E-4 | 2 | C | 2 | CK | SA | O | Active | | | |
| | | | | | | | | | | CVT-O | Q | |
| | | | | | | | | | | CVT-C | Q | TP-01 |
| BGV0095 | M-12BG03(Q) | E-4 | 2 | C | 2 | CK | SA | O | Active | | | |
| | | | | | | | | | | CVT-O | Q | |
| | | | | | | | | | | CVT-C | Q | TP-01 |
| BGV0135 | M-12BG01(Q) | D-2 | 2 | A/C | 0.75 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-02 |
| | | | | | | | | | | CVT-C | CM | CVCM-02 |
| | | | | | | | | | | AT-1 | App J | |
| BGV0147 | M-12BG05(Q) | B-6 | 3 | C | 3 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | Q | |
| | | | | | | | | | | CVT-C | Q | |
| BGV0155 | M-12BG05(Q) | B-6 | 3 | C | 0.75 | CK | SA | O | Active | | | |
| | | | | | | | | | | CVT-O | Q | |
| | | | | | | | | | | CVT-C | Q | TP-01 |
| BGV0165 | M-12BG05(Q) | A-6 | 3 | C | 3 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | Q | |
| | | | | | | | | | | CVT-C | Q | |
| BGV0167 | M-12BG05(Q) | B-6 | 3 | C | 0.75 | CK | SA | O | Active | | | |
| | | | | | | | | | | CVT-O | Q | |
| | | | | | | | | | | CVT-C | Q | TP-01 |
| BGV0174 | M-12BG05(Q) | A-4 | 2 | C | 3 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | CS | CSJ-12 |
| | | | | | | | | | | CVT-C | CS | CSJ-12 |
| BGV0589 | M-12BG03(Q) | B-4 | 2 | C | 1 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | Q | |
| | | | | | | | | | | CVT-C | Q | |
| BGV0590 | M-12BG03(Q) | C-4 | 2 | C | 1 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | Q | |
| | | | | | | | | | | CVT-C | Q | |
| BGV0591 | M-12BG03(Q) | D-3 | 2 | C | 2 | CK | SA | O | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-10 |
| | | | | | | | | | | CVT-C | CM | CVCM-10 |
| BGV0850 | M-12BG05(Q) | A-5 | 2 | C | .75x1 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 10Y | |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BGV0851 | M-12BG05(Q) | E-2 | 2 | C | .75x1 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 10Y | |
| BL8046 | M-12BL01(Q) | B-4 | 2 | A/C | 3 | CK | AO | C | Active | | | |
| | | | | | | | | | | CVT-O | Q | TP-01 |
| | | | | | | | | | | CVT-C | Q | |
| | | | | | | | | | | AT-1 | App J | |
| BLHV8047 | M-12BL01(Q) | B-4 | 2 | A | 3 | DIA | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| | | | | | | | | | | AT-1 | App J | |
| BMHV0001 | M-12BM01(Q) | F-5 | 2 | B | 4 | GL | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| BMHV0002 | M-12BM01(Q) | D-5 | 2 | B | 4 | GL | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| BMHV0003 | M-12BM01(Q) | C-5 | 2 | B | 4 | GL | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| BMHV0004 | M-12BM01(Q) | A-5 | 2 | B | 4 | GL | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| BMHV0019 | M-12BM01(Q) | G-7 | 2 | B | 1 | GL | SO | | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| BMHV0020 | M-12BM01(Q) | E-7 | 2 | B | 1 | GL | SO | | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| BMHV0021 | M-12BM01(Q) | D-7 | 2 | B | 1 | GL | SO | | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BMHV0022 | M-12BM01(Q) | B-7 | 2 | B | 1 | GL | SO | | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| BMHV0035 | M-12BM01(Q) | G-7 | 2 | B | 1 | GL | SO | | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| BMHV0036 | M-12BM01(Q) | E-7 | 2 | B | 1 | GL | SO | | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| BMHV0037 | M-12BM01(Q) | C-7 | 2 | B | 1 | GL | SO | | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| BMHV0038 | M-12BM01(Q) | B-7 | 2 | B | 1 | GL | SO | | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| BMHV0065 | M-12BM01(Q) | G-6 | 2 | B | 1 | GL | SO | | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| BMHV0066 | M-12BM01(Q) | E-6 | 2 | B | 1 | GL | SO | | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| BMHV0067 | M-12BM01(Q) | D-6 | 2 | B | 1 | GL | SO | | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| BMHV0068 | M-12BM01(Q) | B-6 | 2 | B | 1 | GL | SO | | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| BMV0045 | M-12BM01(Q) | A-4 | 2 | A | 3 | GA | M | C | Passive | | | |
| | | | | | | | | | | AT-1 | App J | |
| BMV0046 | M-12BM01(Q) | A-3 | 2 | A | 3 | GA | M | C | Passive | | | |
| | | | | | | | | | | AT-1 | App J | |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BN8717 | M-12BN01(Q) | B-5 | 2 | A | 8 | GA | M | C | Passive | | | |
| | | | | | | | | | | PIT | 2Y | |
| | | | | | | | | | | AT-4 | 2Y | |
| BNHCV8800A | M-12BN01(Q) | E-5 | 2 | B | 3 | GL | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| BNHCV8800B | M-12BN01(Q) | E-5 | 2 | B | 3 | GL | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| BNHV0003 | M-12BN01(Q) | C-3 | 2 | B | 12 | GA | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| BNHV0004 | M-12BN01(Q) | A-3 | 2 | B | 12 | GA | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| BNHV8806A | M-12BN01(Q) | B-5 | 2 | A | 8 | GA | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| | | | | | | | | | | AT-4 | 2Y | |
| BNHV8806B | M-12BN01(Q) | D-3 | 2 | A | 8 | GA | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| | | | | | | | | | | AT-4 | 2Y | |
| BNHV8812A | M-12BN01(Q) | B-3 | 2 | B | 14 | GA | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| BNHV8812B | M-12BN01(Q) | D-3 | 2 | B | 14 | GA | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BNHV8813 | M-12BN01(Q) | B-7 | 2 | A | 2 | GL | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| | | | | | | | | | | AT-4 | 2Y | |
| BNLCV0112D | M-12BN01(Q) | A-5 | 2 | A | 8 | GA | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| | | | | | | | | | | AT-4 | 2Y | |
| BNLCV0112E | M-12BN01(Q) | E-3 | 2 | A | 8 | GA | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| | | | | | | | | | | AT-4 | 2Y | |
| BNV0011 | M-12BN01(Q) | F-4 | 2 | B | 24 | GA | M | O | Passive | | | |
| | | | | | | | | | | PIT | 2Y | |
| ECHV0011 | M-12EC01(Q) | H-5 | 3 | B | 12 | BTF | MO | C | Active | | | |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | |
| ECHV0012 | M-12EC01(Q) | E-5 | 3 | B | 12 | BTF | MO | C | Active | | | |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | |
| ECV0004 | M-12EC01(Q) | H-6 | 3 | C | 10 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | Q | |
| | | | | | | | | | | CVT-C | Q | |
| ECV0013 | M-12EC01(Q) | E-6 | 3 | C | 10 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | Q | |
| | | | | | | | | | | CVT-C | Q | |
| ECV0025 | M-12EC01(Q) | F-4 | 3 | B | 6 | GL | M | C | Active | | | |
| | | | | | | | | | | BT-E | 2Y | |
| ECV0033 | M-12EC01(Q) | D-5 | 3 | B | 6 | GL | M | C | Active | | | |
| | | | | | | | | | | BT-E | 2Y | |
| ECV0076 | M-12EC01(Q) | E-4 | 3 | B | 6 | GL | M | C | Active | | | |
| | | | | | | | | | | BT-E | 2Y | |
| ECV0083 | M-12EC02(Q) | C-5 | 2 | A | 6 | GA | M | C | Passive | | | |
| | | | | | | | | | | AT-1 | App J | |
| ECV0084 | M-12EC02(Q) | C-6 | 2 | A | 6 | GA | M | C | Passive | | | |
| | | | | | | | | | | AT-1 | App J | |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ECV0087 | M-12EC02(Q) | D-7 | 2 | A | 6 | GA | M | C | Passive | | | |
| | | | | | | | | | | AT-1 | App J | |
| ECV0088 | M-12EC02(Q) | D-7 | 2 | A | 6 | GA | M | C | Passive | | | |
| | | | | | | | | | | AT-1 | App J | |
| ECV0095 | M-12EC02(Q) | B-5 | 2 | A | 3 | GA | M | C | Passive | | | |
| | | | | | | | | | | AT-1 | App J | |
| ECV0096 | M-12EC02(Q) | B-5 | 2 | A | 3 | GA | M | C | Passive | | | |
| | | | | | | | | | | AT-1 | App J | |
| EFHV0023 | M-12EF01(Q) | F-7 | 3 | B | 30 | BTF | MO | C | Active | | | |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | |
| EFHV0024 | M-12EF01(Q) | F-7 | 3 | B | 30 | BTF | MO | C | Active | | | |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | |
| EFHV0025 | M-12EF01(Q) | F-7 | 3 | B | 30 | BTF | MO | C | Active | | | |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EFHV0026 | M-12EF01(Q) | F-7 | 3 | B | 30 | BTF | MO | C | Active | | | |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EFHV0031 | M-12EF02(Q) | G-8 | 2 | A | 14 | BTF | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | AT-1 | App J | |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EFHV0032 | M-12EF02(Q) | C-8 | 2 | A | 14 | BTF | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | AT-1 | App J | |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EFHV0033 | M-12EF02(Q) | G-7 | 2 | A | 14 | BTF | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | AT-1 | App J | |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EFHV0034 | M-12EF02(Q) | C-7 | 2 | A | 14 | BTF | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | AT-1 | App J | |
| | | | | | | | | | | BT-E | RC | TP-11 |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EFHV0037 | M-12EF02(Q) | G-3 | 3 | B | 30 | BTF | MO | O | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EFHV0038 | M-12EF02(Q) | C-3 | 3 | B | 30 | BTF | MO | O | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EFHV0039 | M-12EF02(Q) | F-3 | 3 | B | 30 | BTF | MO | C | Active | | | |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EFHV0040 | M-12EF02(Q) | D-3 | 3 | B | 30 | BTF | MO | C | Active | | | |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EFHV0041 | M-12EF02(Q) | E-3 | 3 | B | 30 | BTF | MO | C | Active | | | |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EFHV0042 | M-12EF02(Q) | D-3 | 3 | B | 30 | BTF | MO | C | Active | | | |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EFHV0043 | M-12EF02(Q) | E-7 | 3 | B | 2 | GL | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| EFHV0044 | M-12EF02(Q) | B-7 | 3 | B | 2 | GL | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| EFHV0045 | M-12EF02(Q) | G-6 | 2 | A | 14 | BTF | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | AT-1 | App J | |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EFHV0046 | M-12EF02(Q) | C-6 | 2 | A | 14 | BTF | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | AT-1 | App J | |
| | | | | | | | | | | BT-E | RC | TP-11 |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EFHV0049 | M-12EF02(Q) | G-6 | 2 | A | 14 | BTF | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | AT-1 | App J | |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EFHV0050 | M-12EF02(Q) | C-6 | 2 | A | 14 | BTF | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | AT-1 | App J | |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EFHV0051 | M-12EF02(Q) | G-5 | 3 | B | 24 | BTF | MO | O | Passive | | | |
| | | | | | | | | | | PIT | 2Y | |
| EFHV0052 | M-12EF02(Q) | D-5 | 3 | B | 24 | BTF | MO | O | Passive | | | |
| | | | | | | | | | | PIT | 2Y | |
| EFHV0059 | M-12EF02(Q) | G-3 | 3 | B | 24 | BTF | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EFHV0060 | M-12EF02(Q) | C-3 | 3 | B | 24 | BTF | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EFHV0091 | M-12EF01(Q) | F-6 | 3 | B | 3 | GA | MO | O | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EFHV0092 | M-12EF01(Q) | B-6 | 3 | B | 3 | GA | MO | O | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EFHV0097 | M-12EF01(Q) | E-5 | 3 | B | 3 | GA | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EFHV0098 | M-12EF01(Q) | B-5 | 3 | B | 3 | GA | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EFPDV0019 | M-12EF01(Q) | E-4 | 3 | B | 3 | GA | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EFPDV0020 | M-12EF01(Q) | B-4 | 3 | B | 3 | GA | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EFV0001 | M-12EF01(Q) | F-4 | 3 | C | 30 | CK | SA | O | Active | | | |
| | | | | | | | | | | CVT-O | Q | |
| | | | | | | | | | | CVT-C | Q | TP-01 |
| EFV0004 | M-12EF01(Q) | C-4 | 3 | C | 30 | CK | SA | O | Active | | | |
| | | | | | | | | | | CVT-O | Q | |
| | | | | | | | | | | CVT-C | Q | TP-01 |
| EFV0046 | M-12EF01(Q) | E-6 | 3 | C | 30 | CK | SA | O | Active | | | |
| | | | | | | | | | | CVT-O | Q | |
| | | | | | | | | | | CVT-C | Q | TP-01 |
| EFV0076 | M-12EF01(Q) | B-6 | 3 | C | 30 | CK | SA | O | Active | | | |
| | | | | | | | | | | CVT-O | Q | |
| | | | | | | | | | | CVT-C | Q | TP-01 |
| EFV0470 | M-12EF01(Q) | F-7 | 3 | C | 30 | CK | SA | O | Active | | | |
| | | | | | | | | | | CVT-O | Q | |
| | | | | | | | | | | CVT-C | Q | TP-01 |
| EFV0471 | M-12EF01(Q) | E-7 | 3 | C | 30 | CK | SA | O | Active | | | |
| | | | | | | | | | | CVT-O | Q | |
| | | | | | | | | | | CVT-C | Q | TP-01 |
| EFV0476 | M-12EF02(Q) | F-4 | 3 | C | 4 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | RR | RJ-09 |
| | | | | | | | | | | CVT-C | RR | RJ-09 |
| EFV0478 | M-12EF02(Q) | F-4 | 3 | C | 4 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | RR | RJ-09 |
| | | | | | | | | | | CVT-C | RR | RJ-09 |
| EFV0482 | M-12EF02(Q) | B-2 | 3 | C | 4 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | RR | RJ-09 |
| | | | | | | | | | | CVT-C | RR | RJ-09 |
| EFV0484 | M-12EF02(Q) | B-2 | 3 | C | 4 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | RR | RJ-09 |
| | | | | | | | | | | CVT-C | RR | RJ-09 |
| EGHV0011 | M-12EG01(Q) | F-8 | 3 | B | 1.5 | GL | MO | O | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EGHV0012 | M-12EG01(Q) | C-8 | 3 | B | 1.5 | GL | MO | O | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EGHV0013 | M-12EG01(Q) | F-7 | 3 | B | 1.5 | GL | MO | O | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EGHV0014 | M-12EG01(Q) | C-7 | 3 | B | 1.5 | GL | MO | O | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EGHV0015 | M-12EG01(Q) | D-6 | 3 | B | 18 | BTF | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EGHV0016 | M-12EG01(Q) | C-6 | 3 | B | 18 | BTF | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EGHV0053 | M-12EG02(Q) | G-5 | 3 | B | 18 | BTF | MO | C | Active | | | |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EGHV0054 | M-12EG02(Q) | E-5 | 3 | B | 18 | BTF | MO | C | Active | | | |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EGHV0058 | M-12EG03(Q) | H-5 | 2 | A | 12 | GA | MO | C | Active | | | |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | AT-1 | App J | |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EGHV0059 | M-12EG03(Q) | C-5 | 2 | A | 12 | GA | MO | C | Active | | | |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | AT-1 | App J | |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EGHV0060 | M-12EG03(Q) | B-5 | 2 | A | 12 | GA | MO | C | Active | | | |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | AT-1 | App J | |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EGHV0061 | M-12EG03(Q) | C-4 | 2 | A | 4 | GA | MO | C | Active | | | |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | AT-1 | App J | |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EGHV0062 | M-12EG03(Q) | B-4 | 2 | A | 4 | GA | MO | C | Active | | | |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | AT-1 | App J | |
| | | | | | | | | | | BT-E | RC | TP-11 |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EGHV0069A | M-12EG03(Q) | G-8 | 3 | B | 14 | BTF | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| EGHV0069B | M-12EG03(Q) | G-6 | 3 | B | 14 | BTF | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| EGHV0070A | M-12EG03(Q) | F-8 | 3 | B | 14 | BTF | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| EGHV0070B | M-12EG03(Q) | F-6 | 3 | B | 14 | BTF | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| EGHV0072 | M-12EG02(Q) | G-2 | 3 | B | 2 | GL | MO | C | Active | | | |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EGHV0073 | M-12EG02(Q) | G-2 | 3 | B | 2 | GL | MO | C | Active | | | |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EGHV0074 | M-12EG02(Q) | G-1 | 3 | B | 2 | GL | MO | C | Active | | | |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EGHV0075 | M-12EG02(Q) | G-1 | 3 | B | 2 | GL | MO | C | Active | | | |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EGHV0101 | M-12EG02(Q) | G-4 | 3 | B | 18 | BTF | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EGHV0102 | M-12EG02(Q) | C-4 | 3 | B | 18 | BTF | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EGHV0127 | M-12EG03(Q) | G-5 | 2 | A | 12 | GA | MO | C | Passive | | | |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | AT-1 | App J | |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EGHV0130 | M-12EG03(Q) | B-5 | 2 | A | 12 | GA | MO | C | Passive | | | |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | AT-1 | App J | |
| EGHV0131 | M-12EG03(Q) | C-5 | 2 | A | 12 | GA | MO | C | Passive | | | |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | AT-1 | App J | |
| EGHV0132 | M-12EG03(Q) | B-4 | 2 | A | 4 | GA | MO | C | Passive | | | |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | AT-1 | App J | |
| EGHV0133 | M-12EG03(Q) | C-5 | 2 | A | 4 | GA | MO | C | Passive | | | |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | AT-1 | App J | |
| EGLV0001 | M-12EG01(Q) | G-7 | 3 | B | 3 | GL | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| EGLV0002 | M-12EG01(Q) | B-7 | 3 | B | 3 | GL | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| EGRV0009 | M-12EG01(Q) | G-6 | 3 | B | 2 | GL | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| EGRV0010 | M-12EG01(Q) | C-6 | 3 | B | 2 | GL | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| EGV0003 | M-12EG01(Q) | G-3 | 3 | C | 20 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | Q | |
| | | | | | | | | | | CVT-C | Q | |
| EGV0007 | M-12EG01(Q) | E-3 | 3 | C | 20 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | Q | |
| | | | | | | | | | | CVT-C | Q | |
| EGV0012 | M-12EG01(Q) | D-3 | 3 | C | 20 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | Q | |
| | | | | | | | | | | CVT-C | Q | |
| EGV0016 | M-12EG01(Q) | B-3 | 3 | C | 20 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | Q | |
| | | | | | | | | | | CVT-C | Q | |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EGV0024 | M-12EG02(Q) | G-6 | 3 | C | .75x1 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 10Y | |
| EGV0027 | M-12EG02(Q) | G-6 | 3 | C | .75x1 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 10Y | |
| EGV0049 | M-12EG02(Q) | G-6 | 3 | C | .75x1 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 10Y | |
| EGV0052 | M-12EG02(Q) | G-6 | 3 | C | .75x1 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 10Y | |
| EGV0124 | M-12EG03(Q) | D-4 | 3 | C | 4 | CK | SA | O | Active | | | |
| | | | | | | | | | | CVT-O | Q | TP-08 |
| | | | | | | | | | | CVT-C | RR | TP-01 |
| EGV0129 | M-12EG03(Q) | D-5 | 3 | C | 4 | CK | SA | O | Active | | | |
| | | | | | | | | | | CVT-O | Q | TP-08 |
| | | | | | | | | | | CVT-C | RR | TP-01 |
| EGV0130 | M-12EG03(Q) | D-6 | 3 | C | 4 | CK | SA | O | Active | | | |
| | | | | | | | | | | CVT-O | Q | TP-08 |
| | | | | | | | | | | CVT-C | RR | TP-01 |
| EGV0131 | M-12EG03(Q) | D-6 | 3 | C | 4 | CK | SA | O | Active | | | |
| | | | | | | | | | | CVT-O | Q | TP-08 |
| | | | | | | | | | | CVT-C | RR | TP-01 |
| EGV0159 | M-12EG01(Q) | G-6 | 3 | C | 2x3 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 10Y | |
| EGV0170 | M-12EG01(Q) | C-6 | 3 | C | 2x3 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 10Y | |
| EGV0204 | M-12EG03(Q) | H-4 | 2 | A/C | 12 | CK | SA | C | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-02 |
| | | | | | | | | | | CVT-C | CM | CVCM-02 |
| | | | | | | | | | | AT-1 | App J | |
| EGV0305 | M-12EG01(Q) | G-6 | 3 | C | 1x1 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 2Y | |
| EGV0306 | M-12EG01(Q) | C-6 | 3 | C | 1x1 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 2Y | |
| EGV0448 | M-12EG03(Q) | F-6 | 3 | C | 8 | CK | SA | C | Active | | | |
| | | | | | | | | | | CVT-O | Q | |
| | | | | | | | | | | CVT-C | Q | |
| EGV0449 | M-12EG03(Q) | F-6 | 3 | C | 8 | CK | SA | C | Active | | | |
| | | | | | | | | | | CVT-O | Q | |
| | | | | | | | | | | CVT-C | Q | |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EJ8708A | M-12EJ01(Q) | G-8 | 2 | C | 3x4 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 10Y | |
| EJ8708B | M-12EJ01(Q) | C-8 | 2 | C | 3x4 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 10Y | |
| EJ8730A | M-12EJ01(Q) | G-4 | 2 | C | 10 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-03 |
| | | | | | | | | | | CVT-C | CM | CVCM-03 |
| EJ8730B | M-12EJ01(Q) | C-4 | 2 | C | 10 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-03 |
| | | | | | | | | | | CVT-C | CM | CVCM-03 |
| EJ8841A | M-12EJ01(Q) | E-2 | 1 | A/C | 6 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-15 |
| | | | | | | | | | | CVT-C | CM | CVCM-15 |
| | | | | | | | | | | AT-2 | 1.5Y | CVCM-15 |
| EJ8841B | M-12EJ01(Q) | D-2 | 1 | A/C | 6 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-15 |
| | | | | | | | | | | CVT-C | CM | CVCM-15 |
| | | | | | | | | | | AT-2 | 1.5Y | CVCM-15 |
| EJ8842 | M-12EJ01(Q) | D-3 | 2 | C | .75x1 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 10Y | |
| EJ8856A | M-12EJ01(Q) | G-3 | 2 | C | .75x1 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 10Y | |
| EJ8856B | M-12EJ01(Q) | B-3 | 2 | C | .75x1 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 10Y | |
| EJ8958A | M-12EJ01(Q) | F-6 | 2 | A/C | 14 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-07 |
| | | | | | | | | | | CVT-C | CM | CVCM-07 |
| | | | | | | | | | | AT-4 | 2Y | CVCM-07 |
| EJ8958B | M-12EJ01(Q) | B-6 | 2 | A/C | 14 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-07 |
| | | | | | | | | | | CVT-C | CM | CVCM-07 |
| | | | | | | | | | | AT-4 | 2Y | CVCM-07 |
| EJ8969A | M-12EJ01(Q) | G-4 | 2 | C | 8 | CK | SA | O | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-08 |
| | | | | | | | | | | CVT-C | CM | CVCM-08 |
| EJ8969B | M-12EJ01(Q) | A-4 | 2 | C | 8 | CK | SA | O | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-08 |
| | | | | | | | | | | CVT-C | CM | CVCM-08 |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EJFCV0610 | M-12EJ01(Q) | H-6 | 2 | B | 3 | GA | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OM1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EJFCV0611 | M-12EJ01(Q) | A-6 | 2 | B | 3 | GA | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OM1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EJFCV0618 | M-12EJ01(Q) | F-5 | 2 | B | 8 | BTF | AO | C | Passive | | | |
| | | | | | | | | | | PIT | 2Y | |
| EJFCV0619 | M-12EJ01(Q) | B-5 | 2 | B | 8 | BTF | AO | C | Passive | | | |
| | | | | | | | | | | PIT | 2Y | |
| EJHCV0606 | M-12EJ01(Q) | G-4 | 2 | B | 10 | BTF | AO | C | Passive | | | |
| | | | | | | | | | | PIT | 2Y | |
| EJHCV0607 | M-12EJ01(Q) | C-4 | 2 | B | 10 | BTF | AO | C | Passive | | | |
| | | | | | | | | | | PIT | 2Y | |
| EJHCV8825 | M-12EJ01(Q) | E-2 | 2 | B | 0.75 | GL | AO | C | Passive | | | |
| | | | | | | | | | | PIT | 2Y | |
| EJHCV8890A | M-12EJ01(Q) | F-3 | 2 | B | 0.75 | GL | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| EJHCV8890B | M-12EJ01(Q) | C-2 | 2 | B | 0.75 | GL | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| EJHV0014 | M-12EJ01(Q) | H-5 | 2 | B | 1 | GL | SO | C | Passive | | | |
| | | | | | | | | | | PIT | 2Y | |
| EJHV0015 | M-12EJ01(Q) | A-5 | 2 | B | 1 | GL | SO | C | Passive | | | |
| | | | | | | | | | | PIT | 2Y | |
| EJHV8701A | M-12EJ01(Q) | F-8 | 1 | A | 12 | GA | MO | C | Active | | | |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | AT-4 | 1.5Y | |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EJHV8701B | M-12EJ01(Q) | F-8 | 1 | A | 12 | GA | MO | C | Active | | | |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | AT-4 | 1.5Y | |
| | | | | | | | | | | BT-E | RC | TP-11 |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EJHV8716A | M-12EJ01(Q) | F-8 | 2 | B | 10 | GA | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EJHV8716B | M-12EJ01(Q) | D-4 | 2 | B | 10 | GA | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EJHV8804A | M-12EJ01(Q) | G-4 | 2 | B | 8 | GA | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EJHV8804B | M-12EJ01(Q) | A-4 | 2 | B | 8 | GA | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EJHV8809A | M-12EJ01(Q) | G-3 | 2 | B | 10 | GA | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EJHV8809B | M-12EJ01(Q) | F-8 | 2 | B | 10 | GA | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EJHV8811A | M-12EJ01(Q) | E-7 | 2 | B | 14 | GA | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | RJ-6 |
| EJHV8811B | M-12EJ01(Q) | D-7 | 2 | B | 14 | GA | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | RJ-6 |
| EJHV8840 | M-12EJ01(Q) | E-3 | 2 | B | 10 | GA | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EM8815 | M-12EM02(Q) | D-3 | 1 | A/C | 3 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | RR | RJ-07 |
| | | | | | | | | | | CVT-C | 1.5Y | RJ-07 |
| | | | | | | | | | | AT-2 | 1.5Y | |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EM8851 | M-12EM01(Q) | C-4 | 2 | C | .75x1 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 10Y | |
| EM8853A | M-12EM01(Q) | F-5 | 2 | C | .75x1 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 10Y | |
| EM8853B | M-12EM01(Q) | E-5 | 2 | C | .75x1 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 10Y | |
| EM8858A | M-12EM01(Q) | E-7 | 2 | C | .75x1 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 10Y | |
| EM8858B | M-12EM01(Q) | D-7 | 2 | C | .75x1 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 10Y | |
| EM8922A | M-12EM01(Q) | E-6 | 2 | C | 4 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | RR | RJ-08 |
| | | | | | | | | | | CVT-C | RR | RJ-08 |
| EM8922B | M-12EM01(Q) | D-5 | 2 | C | 4 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | RR | RJ-08 |
| | | | | | | | | | | CVT-C | RR | RJ-08 |
| EM8926A | M-12EM01(Q) | E-7 | 2 | A/C | 8 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-05 |
| | | | | | | | | | | CVT-C | CM | CVCM-05 |
| | | | | | | | | | | AT-4 | 2Y | |
| EM8926B | M-12EM01(Q) | D-7 | 2 | A/C | 8 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-05 |
| | | | | | | | | | | CVT-C | CM | CVCM-05 |
| | | | | | | | | | | AT-4 | 2Y | |
| EMHV8801A | M-12EM02(Q) | D-4 | 2 | B | 4 | GA | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EMHV8801B | M-12EM02(Q) | D-4 | 2 | B | 4 | GA | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EMHV8802A | M-12EM02(Q) | E-4 | 2 | B | 4 | GA | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EMHV8802B | M-12EM02(Q) | D-4 | 2 | B | 4 | GA | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EMHV8803A | M-12EM02(Q) | C-7 | 2 | B | 4 | GA | MO | O | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EMHV8803B | M-12EM02(Q) | A-7 | 2 | B | 4 | GA | MO | O | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EMHV8807A | M-12EM01(Q) | G-7 | 2 | B | 6 | GA | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EMHV8807B | M-12EM01(Q) | F-7 | 2 | B | 6 | GA | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EMHV8814A | M-12EM01(Q) | B-6 | 2 | A | 1.5 | GL | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | AT-4 | 2Y | |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EMHV8814B | M-12EM01(Q) | B-5 | 2 | A | 1.5 | GL | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | AT-4 | 2Y | |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EMHV8821A | M-12EM01(Q) | E-4 | 2 | B | 4 | GA | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EMHV8821B | M-12EM01(Q) | D-4 | 2 | B | 4 | GA | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EMHV8823 | M-12EM01(Q) | C-4 | 2 | B | 0.75 | GL | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| EMHV8824 | M-12EM01(Q) | D-3 | 2 | B | 0.75 | GL | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EMHV8835 | M-12EM01(Q) | B-4 | 2 | B | 4 | GA | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| EMHV8843 | M-12EM02(Q) | C-4 | 2 | B | 0.75 | GL | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| EMHV8871 | M-12EM01(Q) | H-5 | 2 | A | 0.75 | GL | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| | | | | | | | | | | AT-1 | App J | |
| EMHV8881 | M-12EM01(Q) | G-4 | 2 | B | 0.75 | GL | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| EMHV8882 | M-12EM02(Q) | C-3 | 2 | B | 0.75 | GL | AO | C | Passive | | | |
| | | | | | | | | | | PIT | 2Y | |
| EMHV8888 | M-12EM01(Q) | F-6 | 2 | A | 1 | GL | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| | | | | | | | | | | AT-1 | App J | |
| EMHV8889A | M-12EM01(Q) | G-2 | 2 | B | 0.75 | GL | AO | C | Passive | | | |
| | | | | | | | | | | PIT | 2Y | |
| EMHV8889B | M-12EM01(Q) | G-3 | 2 | B | 0.75 | GL | AO | C | Passive | | | |
| | | | | | | | | | | PIT | 2Y | |
| EMHV8889C | M-12EM01(Q) | G-2 | 2 | B | 0.75 | GL | AO | C | Passive | | | |
| | | | | | | | | | | PIT | 2Y | |
| EMHV8889D | M-12EM01(Q) | G-2 | 2 | B | 0.75 | GL | AO | C | Passive | | | |
| | | | | | | | | | | PIT | 2Y | |
| EMHV8923A | M-12EM01(Q) | E-7 | 2 | B | 6 | GA | MO | | Passive | | | |
| | | | | | | | | | | PIT | 2Y | |
| EMHV8923B | M-12EM01(Q) | D-7 | 2 | B | 6 | GA | MO | C | Passive | | | |
| | | | | | | | | | | PIT | 2Y | |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EMHV8964 | M-12EM01(Q) | H-5 | 2 | A | 0.75 | GL | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| | | | | | | | | | | AT-1 | App J | |
| EMV0001 | M-12EM01(Q) | F-3 | 1 | A/C | 2 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-13 |
| | | | | | | | | | | CVT-C | CM | CVCM-13 |
| | | | | | | | | | | AT-2 | 1.5Y | CVCM-13 |
| EMV0002 | M-12EM01(Q) | E-3 | 1 | A/C | 2 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-13 |
| | | | | | | | | | | CVT-C | CM | CVCM-13 |
| | | | | | | | | | | AT-2 | 1.5Y | CVCM-13 |
| EMV0003 | M-12EM01(Q) | D-3 | 1 | A/C | 2 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-13 |
| | | | | | | | | | | CVT-C | CM | CVCM-13 |
| | | | | | | | | | | AT-2 | 1.5Y | CVCM-13 |
| EMV0004 | M-12EM01(Q) | C-3 | 1 | A/C | 2 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-13 |
| | | | | | | | | | | CVT-C | CM | CVCM-13 |
| | | | | | | | | | | AT-2 | 1.5Y | CVCM-13 |
| EMV0005 | M-12EM01(Q) | A-6 | 2 | C | 1.5 | CK | SA | O | Active | | | |
| | | | | | | | | | | CVT-O | Q | |
| | | | | | | | | | | CVT-C | Q | TP-01 |
| EMV0006 | M-12EM01(Q) | F-6 | 2 | A/C | 1 | CK | SA | O | Active | | | |
| | | | | | | | | | | CVT-O | RR | TP-01 |
| | | | | | | | | | | CVT-C | Q | |
| | | | | | | | | | | AT-1 | App J | |
| EMV0007 | M-12EM01(Q) | A-5 | 2 | C | 1.5 | CK | SA | O | Active | | | |
| | | | | | | | | | | CVT-O | Q | |
| | | | | | | | | | | CVT-C | Q | TP-01 |
| EMV0251 | M-12EM01(Q) | H-4 | 3 | C | .75x1 | RV | SA | O | Active | | | |
| | | | | | | | | | | RVT | 10Y | |
| ENHV0001 | M-12EN01(Q) | G-7 | 2 | B | 12 | GA | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ENHV0006 | M-12EN01(Q) | G-4 | 2 | B | 10 | GA | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| ENHV0007 | M-12EN01(Q) | B-7 | 2 | B | 12 | GA | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| ENHV0012 | M-12EN01(Q) | B-4 | 2 | B | 10 | GA | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| ENHV0015 | M-12EN01(Q) | E-6 | 2 | B | 3 | GA | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| ENHV0016 | M-12EN01(Q) | D-6 | 2 | B | 3 | GA | MO | O/C | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| ENV0002 | M-12EN01(Q) | G-7 | 2 | C | 12 | CK | SA | O | Active | | | |
| | | | | | | | | | | CVT-O | SDE | TP-10 |
| | | | | | | | | | | CVT-C | SDE | TP-10 |
| ENV0003 | M-12EN01(Q) | G-7 | 2 | A/C | 12 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | SDE | TP-10 |
| | | | | | | | | | | CVT-C | 2Y/SDE | TP-10 |
| | | | | | | | | | | AT-4 | 2Y | |
| ENV0004 | M-12EN01(Q) | G-5 | 2 | C | 10 | CK | SA | O | Active | | | |
| | | | | | | | | | | CVT-O | SDE | TP-10 |
| | | | | | | | | | | CVT-C | SDE | TP-10 |
| ENV0008 | M-12EN01(Q) | B-7 | 2 | C | 12 | CK | SA | O | Active | | | |
| | | | | | | | | | | CVT-O | SDE | TP-10 |
| | | | | | | | | | | CVT-C | SDE | TP-10 |
| ENV0009 | M-12EN01(Q) | B-7 | 2 | A/C | 12 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | SDE | TP-10 |
| | | | | | | | | | | CVT-C | 2Y/SDE | TP-10 |
| | | | | | | | | | | AT-4 | 2Y | |
| ENV0010 | M-12EN01(Q) | B-5 | 2 | C | 10 | CK | SA | O | Active | | | |
| | | | | | | | | | | CVT-O | SDE | TP-10 |
| | | | | | | | | | | CVT-C | SDE | TP-10 |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ENV0013 | M-12EN01(Q) | G-4 | 2 | C | 10 | CK | SA | O | Active | | | |
| | | | | | | | | | | CVT-O | SDE | TP-10 |
| | | | | | | | | | | CVT-C | SDE | TP-10 |
| ENV0017 | M-12EN01(Q) | B-4 | 2 | C | 10 | CK | SA | O | Active | | | |
| | | | | | | | | | | CVT-O | SDE | TP-10 |
| | | | | | | | | | | CVT-C | SDE | TP-10 |
| ENV0057 | M-12EN01(Q) | F-5 | 2 | C | .75x1 | RV | SA | O | Active | | | |
| | | | | | | | | | | RVT | 10Y | |
| ENV0058 | M-12EN01(Q) | F-5 | 2 | C | 1x1 | RV | SA | O | Active | | | |
| | | | | | | | | | | RVT | 2Y | 4VR-01 |
| ENV0097 | M-12EN01(Q) | D-5 | 2 | B | 3 | GA | M | O | Passive | | | |
| | | | | | | | | | | PIT | 2Y | |
| ENV0099 | M-12EN01(Q) | F-6 | 2 | C | 3 | CK | SA | O | Active | | | |
| | | | | | | | | | | CVT-O | Q | |
| | | | | | | | | | | CVT-C | Q | TP-01 |
| ENV0101 | M-12EN01(Q) | C-6 | 2 | C | 3 | CK | SA | O | Active | | | |
| | | | | | | | | | | CVT-O | Q | |
| | | | | | | | | | | CVT-C | Q | TP-01 |
| ENV0106 | M-12EN01(Q) | F-5 | 2 | C | 1x1 | RV | SA | O | Active | | | |
| | | | | | | | | | | RVT | 2Y | 4VR-01 |
| EP8818A | M-12EP01(Q) | G-3 | 1 | A/C | 6 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-01 |
| | | | | | | | | | | CVT-C | CM | CVCM-01 |
| | | | | | | | | | | AT-2 | 1.5Y | CVCM-01 |
| EP8818B | M-12EP01(Q) | F-3 | 1 | A/C | 6 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-01 |
| | | | | | | | | | | CVT-C | CM | CVCM-01 |
| | | | | | | | | | | AT-2 | 1.5Y | CVCM-01 |
| EP8818C | M-12EP01(Q) | D-3 | 1 | A/C | 6 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-01 |
| | | | | | | | | | | CVT-C | CM | CVCM-01 |
| | | | | | | | | | | AT-2 | 1.5Y | CVCM-01 |
| EP8818D | M-12EP01(Q) | C-3 | 1 | A/C | 6 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-01 |
| | | | | | | | | | | CVT-C | CM | CVCM-01 |
| | | | | | | | | | | AT-2 | 1.5Y | CVCM-01 |
| EP8855A | M-12EP01(Q) | H-7 | 2 | C | 1x2 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 10Y | |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EP8855B | M-12EP01(Q) | F-7 | 2 | C | 1x2 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 10Y | |
| EP8855C | M-12EP01(Q) | D-7 | 2 | C | 1x2 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 10Y | |
| EP8855D | M-12EP01(Q) | C-7 | 2 | C | 1x2 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 10Y | |
| EP8956A | M-12EP01(Q) | G-4 | 1 | A/C | 10 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-09 |
| | | | | | | | | | | CVT-C | CM | CVCM-09 |
| | | | | | | | | | | AT-2 | 1.5Y | CVCM-09 |
| EP8956B | M-12EP01(Q) | E-4 | 1 | A/C | 10 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-09 |
| | | | | | | | | | | CVT-C | CM | CVCM-09 |
| | | | | | | | | | | AT-2 | 1.5Y | CVCM-09 |
| EP8956C | M-12EP01(Q) | C-4 | 1 | A/C | 10 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-09 |
| | | | | | | | | | | CVT-C | CM | CVCM-09 |
| | | | | | | | | | | AT-2 | 1.5Y | CVCM-09 |
| EP8956D | M-12EP01(Q) | B-4 | 1 | A/C | 10 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-09 |
| | | | | | | | | | | CVT-C | CM | CVCM-09 |
| | | | | | | | | | | AT-2 | 1.5Y | CVCM-09 |
| EPHV8808A | M-12EP01(Q) | G-5 | 1 | B | 10 | GA | MO | O | Passive | | | |
| | | | | | | | | | | PIT | 2Y | |
| EPHV8808B | M-12EP01(Q) | E-5 | 1 | B | 10 | GA | MO | O | Passive | | | |
| | | | | | | | | | | PIT | 2Y | |
| EPHV8808C | M-12EP01(Q) | C-5 | 1 | B | 10 | GA | MO | O | Passive | | | |
| | | | | | | | | | | PIT | 2Y | |
| EPHV8808D | M-12EP01(Q) | B-5 | 1 | B | 10 | GA | MO | O | Passive | | | |
| | | | | | | | | | | PIT | 2Y | |
| EPHV8875A | M-12EP01(Q) | H-6 | 2 | B | 1 | GL | AO | C | Passive | | | |
| | | | | | | | | | | PIT | 2Y | |
| EPHV8875B | M-12EP01(Q) | F-6 | 2 | B | 1 | GL | AO | C | Passive | | | |
| | | | | | | | | | | PIT | 2Y | |
| EPHV8875C | M-12EP01(Q) | D-6 | 2 | B | 1 | GL | AO | C | Passive | | | |
| | | | | | | | | | | PIT | 2Y | |
| EPHV8875D | M-12EP01(Q) | C-6 | 2 | B | 1 | GL | AO | C | Passive | | | |
| | | | | | | | | | | PIT | 2Y | |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EPHV8877A | M-12EP01(Q) | F-4 | 2 | B | 0.75 | GL | AO | C | Passive | | | |
| | | | | | | | | | | PIT | 2Y | |
| EPHV8877B | M-12EP01(Q) | E-4 | 2 | B | 0.75 | GL | AO | C | Passive | | | |
| | | | | | | | | | | PIT | 2Y | |
| EPHV8877C | M-12EP01(Q) | C-4 | 2 | B | 0.75 | GL | AO | C | Passive | | | |
| | | | | | | | | | | PIT | 2Y | |
| EPHV8877D | M-12EP01(Q) | B-4 | 2 | B | 0.75 | GL | AO | C | Passive | | | |
| | | | | | | | | | | PIT | 2Y | |
| EPHV8878A | M-12EP01(Q) | G-5 | 2 | B | 1 | GL | AO | C | Passive | | | |
| | | | | | | | | | | PIT | 2Y | |
| EPHV8878B | M-12EP01(Q) | E-5 | 2 | B | 1 | GL | AO | C | Passive | | | |
| | | | | | | | | | | PIT | 2Y | |
| EPHV8878C | M-12EP01(Q) | D-5 | 2 | B | 1 | GL | AO | C | Passive | | | |
| | | | | | | | | | | PIT | 2Y | |
| EPHV8878D | M-12EP01(Q) | B-5 | 2 | B | 1 | GL | AO | C | Passive | | | |
| | | | | | | | | | | PIT | 2Y | |
| EPHV8879A | M-12EP01(Q) | G-4 | 2 | B | 0.75 | GL | AO | C | Passive | | | |
| | | | | | | | | | | PIT | 2Y | |
| EPHV8879B | M-12EP01(Q) | E-4 | 2 | B | 0.75 | GL | AO | C | Passive | | | |
| | | | | | | | | | | PIT | 2Y | |
| EPHV8879C | M-12EP01(Q) | D-4 | 2 | B | 0.75 | GL | AO | O | Passive | | | |
| | | | | | | | | | | PIT | 2Y | |
| EPHV8879D | M-12EP01(Q) | C-2 | 2 | B | 0.75 | GL | AO | C | Passive | | | |
| | | | | | | | | | | PIT | 2Y | |
| EPHV8880 | M-12EP01(Q) | A-4 | 2 | A | 1 | GL | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| | | | | | | | | | | AT-1 | App J | |
| EPHV8950A | M-12EP01(Q) | H-7 | 2 | B | 1 | GL | SO | O/C | Active | | | |
| | | | | | | | | | | BT-O | CS | CSJ-13 |
| | | | | | | | | | | BT-C | CS | CSJ-13 |
| | | | | | | | | | | FST | CS | CSJ-13, TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| EPHV8950B | M-12EP01(Q) | F-8 | 2 | B | 1 | GL | SO | O/C | Active | | | |
| | | | | | | | | | | BT-O | CS | CSJ-13 |
| | | | | | | | | | | BT-C | CS | CSJ-13 |
| | | | | | | | | | | FST | CS | CSJ-13, TP-04 |
| | | | | | | | | | | PIT | 2Y | |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EPHV8950C | M-12EP01(Q) | F-7 | 2 | B | 1 | GL | SO | O/C | Active | | | |
| | | | | | | | | | | BT-O | CS | CSJ-13 |
| | | | | | | | | | | BT-C | CS | CSJ-13 |
| | | | | | | | | | | FST | CS | CSJ-13, TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| EPHV8950D | M-12EP01(Q) | D-8 | 2 | B | 1 | GL | SO | O/C | Active | | | |
| | | | | | | | | | | BT-O | CS | CSJ-13 |
| | | | | | | | | | | BT-C | CS | CSJ-13 |
| | | | | | | | | | | FST | CS | CSJ-13, TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| EPHV8950E | M-12EP01(Q) | D-7 | 2 | B | 1 | GL | SO | O/C | Active | | | |
| | | | | | | | | | | BT-O | CS | CSJ-13 |
| | | | | | | | | | | BT-C | CS | CSJ-13 |
| | | | | | | | | | | FST | CS | CSJ-13, TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| EPHV8950F | M-12EP01(Q) | C-8 | 2 | B | 1 | GL | SO | O/C | Active | | | |
| | | | | | | | | | | BT-O | CS | CSJ-13 |
| | | | | | | | | | | BT-C | CS | CSJ-13 |
| | | | | | | | | | | FST | CS | CSJ-13, TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| EPV0010 | M-12EP01(Q) | G-3 | 1 | A/C | 2 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-06 |
| | | | | | | | | | | CVT-C | CM | CVCM-06 |
| | | | | | | | | | | AT-2 | 1.5Y | CVCM-06 |
| EPV0020 | M-12EP01(Q) | F-3 | 1 | A/C | 2 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-06 |
| | | | | | | | | | | CVT-C | CM | CVCM-06 |
| | | | | | | | | | | AT-2 | 1.5Y | CVCM-06 |
| EPV0030 | M-12EP01(Q) | D-3 | 1 | A/C | 2 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-06 |
| | | | | | | | | | | CVT-C | CM | CVCM-06 |
| | | | | | | | | | | AT-2 | 1.5Y | CVCM-06 |
| EPV0040 | M-12EP01(Q) | C-36 | 1 | A/C | 2 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-06 |
| | | | | | | | | | | CVT-C | CM | CVCM-06 |
| | | | | | | | | | | AT-2 | 1.5Y | CVCM-06 |
| EPV0046 | M-12EP01(Q) | A-5 | 2 | A/C | 1 | CK | SA | C | Active | | | |
| | | | | | | | | | | CVT-O | Q | TP-01, TP-08 |
| | | | | | | | | | | CVT-C | Q | |
| | | | | | | | | | | AT-1 | App J | |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE /PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FCHV0312 | M-12FC02(Q) | B-5 | 3 | B | 4 | GA | MO | O | Active | | | |
| | | | | | | | | | | OMN1-O | JOG | TP-11 |
| | | | | | | | | | | BT-E | Q | TP-11 |
| FCV0001 | M-12FC02(Q) | G-6 | 2 | C | 4 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-11 |
| | | | | | | | | | | CVT-C | CM | CVCM-11 |
| FCV0002 | M-12FC02(Q) | G-6 | 2 | C | 4 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-11 |
| | | | | | | | | | | CVT-C | CM | CVCM-11 |
| FCV0024 | M-12FC02(Q) | G-6 | 2 | C | 4 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-11 |
| | | | | | | | | | | CVT-C | CM | CVCM-11 |
| FCV0025 | M-12FC02(Q) | G-6 | 2 | C | 4 | CK | SA | O/C | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-11 |
| | | | | | | | | | | CVT-C | CM | CVCM-11 |
| GKPSV0004AA | M-12GK01(Q) | | 3 | C | .75x1 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 10Y | |
| GKPSV0004AB | M-12GK01(Q) | | 3 | C | .75x1 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 10Y | |
| GKPSV0004BA | M-12GK01(Q) | | 3 | C | .75x1 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 10Y | |
| GKPSV0004BB | M-12GK01(Q) | | 3 | C | .75x1 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 10Y | |
| GKPSV0005AA | M-12GK01(Q) | | 3 | C | .75x1 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 10Y | |
| GKPSV0005AB | M-12GK01(Q) | | 3 | C | .75x1 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 10Y | |
| GKPSV0005BA | M-12GK01(Q) | | 3 | C | .75x1 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 10Y | |
| GKPSV0005BB | M-12GK01(Q) | | 3 | C | .75x1 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 10Y | |
| GSHV0003 | M-12GS01(Q) | E-6 | 2 | A | 1 | GA | SO | O/C | Active | | | |
| | | | | | | | | | | BT-O | Q | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | |
| | | | | | | | | | | PIT | 2Y | TP-04 |
| | | | | | | | | | | AT-1 | App J | |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE /PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GSHV0004 | M-12GS01(Q) | E-6 | 2 | A | 1 | GA | SO | O/C | Active | | | |
| | | | | | | | | | | BT-O | Q | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | |
| | | | | | | | | | | PIT | 2Y | TP-04 |
| | | | | | | | | | | AT-1 | App J | |
| GSHV0005 | M-12GS01(Q) | D-6 | 2 | A | 1 | GA | SO | O/C | Active | | | |
| | | | | | | | | | | BT-O | Q | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | |
| | | | | | | | | | | PIT | 2Y | TP-04 |
| | | | | | | | | | | AT-1 | App J | |
| GSHV0008 | M-12GS01(Q) | B-6 | 2 | A | 1 | GA | SO | O/C | Active | | | |
| | | | | | | | | | | BT-O | Q | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | |
| | | | | | | | | | | PIT | 2Y | TP-04 |
| | | | | | | | | | | AT-1 | App J | |
| GSHV0009 | M-12GS01(Q) | B-6 | 2 | A | 1 | GA | SO | O/C | Active | | | |
| | | | | | | | | | | BT-O | Q | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | |
| | | | | | | | | | | PIT | 2Y | TP-04 |
| | | | | | | | | | | AT-1 | App J | |
| GSHV0012 | M-12GS01(Q) | E-4 | 2 | A | 1 | GA | SO | O/C | Active | | | |
| | | | | | | | | | | BT-O | Q | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | |
| | | | | | | | | | | PIT | 2Y | TP-04 |
| | | | | | | | | | | AT-1 | App J | |
| GSHV0013 | M-12GS01(Q) | E-5 | 2 | A | 1 | GA | SO | O/C | Active | | | |
| | | | | | | | | | | BT-O | Q | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | |
| | | | | | | | | | | PIT | 2Y | TP-04 |
| | | | | | | | | | | AT-1 | App J | |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GSHV0014 | M-12GS01(Q) | D-5 | 2 | A | 1 | GA | SO | O/C | Active | | | |
| | | | | | | | | | | BT-O | Q | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | |
| | | | | | | | | | | PIT | 2Y | TP-04 |
| | | | | | | | | | | AT-1 | App J | |
| GSHV0017 | M-12GS01(Q) | B-4 | 2 | A | 1 | GA | SO | O/C | Active | | | |
| | | | | | | | | | | BT-O | Q | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | |
| | | | | | | | | | | PIT | 2Y | TP-04 |
| | | | | | | | | | | AT-1 | App J | |
| GSHV0018 | M-12GS01(Q) | B-5 | 2 | A | 1 | GA | SO | O/C | Active | | | |
| | | | | | | | | | | BT-O | Q | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | |
| | | | | | | | | | | PIT | 2Y | TP-04 |
| | | | | | | | | | | AT-1 | App J | |
| GSHV0020 | M-12GS01(Q) | F-4 | 2 | A | 6 | BTF | MO | C | Passive | | | |
| | | | | | | | | | | PIT | 2Y | |
| | | | | | | | | | | AT-1 | App J | |
| GSHV0021 | M-12GS01(Q) | F-4 | 2 | A | 6 | BTF | MO | C | Passive | | | |
| | | | | | | | | | | PIT | 2Y | |
| | | | | | | | | | | AT-1 | App J | |
| GSHV0030 | M-12GS01(Q) | E-3 | 2 | B | 1 | GA | SO | C | Passive | | | |
| | | | | | | | | | | PIT | 2Y | |
| GSHV0031 | M-12GS01(Q) | D-4 | 2 | A | 1 | GA | SO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| | | | | | | | | | | AT-1 | App J | |
| GSHV0032 | M-12GS01(Q) | D-3 | 2 | A | 1 | GA | SO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| | | | | | | | | | | AT-1 | App J | |
| GSHV0033 | M-12GS01(Q) | C-4 | 2 | A | 1 | GA | SO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| | | | | | | | | | | AT-1 | App J | |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GSHV0034 | M-12GS01(Q) | C-4 | 2 | A | 1 | GA | SO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| | | | | | | | | | | AT-1 | App J | |
| GSHV0035 | M-12GS01(Q) | E-8 | 2 | B | 1 | GA | SO | C | Passive | | | |
| | | | | | | | | | | PIT | 2Y | |
| GSHV0036 | M-12GS01(Q) | D-6 | 2 | A | 1 | GA | SO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| | | | | | | | | | | AT-1 | App J | |
| GSHV0037 | M-12GS01(Q) | D-7 | 2 | A | 1 | GA | SO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| | | | | | | | | | | AT-1 | App J | |
| GSHV0038 | M-12GS01(Q) | C-6 | 2 | A | 1 | GA | SO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| | | | | | | | | | | AT-1 | App J | |
| GSHV0039 | M-12GS01(Q) | C-6 | 2 | A | 1 | GA | SO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| | | | | | | | | | | AT-1 | App J | |
| GSV0054 | M-12GS01(Q) | B-3 | 2 | C | 0.75 | CK | SA | C | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-12 |
| | | | | | | | | | | CVT-C | CM | CVCM-12 |
| GSV0059 | M-12GS01(Q) | B-8 | 2 | C | 0.75 | CK | SA | C | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-12 |
| | | | | | | | | | | CVT-C | CM | CVCM-12 |
| GTHZ0004 | M-12GT01(Q) | D-4 | 2 | A | 18 | BTF | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| | | | | | | | | | | AT-1 | App J | |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GTHZ0005 | M-12GT01(Q) | A-5 | 2 | A | 18 | BTF | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| | | | | | | | | | | AT-1 | App J | |
| GTHZ0006 | M-12GT01(Q) | C-4 | 2 | A | 36 | BTF | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| | | | | | | | | | | AT-1 | App J | |
| GTHZ0007 | M-12GT01(Q) | C-5 | 2 | A | 36 | BTF | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| | | | | | | | | | | AT-1 | App J | |
| GTHZ0008 | M-12GT01(Q) | C-6 | 2 | A | 36 | BTF | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| | | | | | | | | | | AT-1 | App J | |
| GTHZ0009 | M-12GT01(Q) | C-7 | 2 | A | 36 | BTF | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| | | | | | | | | | | AT-1 | App J | |
| GTHZ0011 | M-12GT01(Q) | A-6 | 2 | A | 18 | BTF | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| | | | | | | | | | | AT-1 | App J | |
| GTHZ0012 | M-12GT01(Q) | A-7 | 2 | A | 18 | BTF | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| | | | | | | | | | | AT-1 | App J | |
| HBHV7126 | M-12HB01(Q) | H-7 | 2 | A | 0.75 | DIA | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | TP-04 |
| | | | | | | | | | | FST | Q | |
| | | | | | | | | | | PIT | 2Y | |
| | | | | | | | | | | AT-1 | App J | |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HBHV7136 | M-12HB01(Q) | F-3 | 2 | A | 3 | DIA | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| | | | | | | | | | | AT-1 | App J | |
| HBHV7150 | M-12HB01(Q) | H-6 | 2 | A | 0.75 | DIA | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | TP-04 |
| | | | | | | | | | | FST | Q | |
| | | | | | | | | | | PIT | 2Y | |
| | | | | | | | | | | AT-1 | App J | |
| HBHV7176 | M-12HB01(Q) | E-3 | 2 | A | 3 | DIA | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | TP-04 |
| | | | | | | | | | | FST | Q | |
| | | | | | | | | | | PIT | 2Y | |
| | | | | | | | | | | AT-1 | App J | |
| HDV0016 | M-12HD01(Q) | B-7 | 2 | A | 2 | GL | M | C | Passive | | | |
| | | | | | | | | | | AT-1 | App J | |
| HDV0017 | M-12HD01(Q) | B-7 | 2 | A | 2 | GL | M | C | Passive | | | |
| | | | | | | | | | | AT-1 | App J | |
| KAFV0029 | M-12KA01(Q) | D-2 | 2 | A | 2 | GL | AO | C | Active | | | |
| | | | | | | | | | | BT-C | RR | RJ-12 |
| | | | | | | | | | | FST | RR | RJ-12, TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| | | | | | | | | | | AT-1 | App J | |
| KAV0039 | M-12KA02(Q) | C-6 | 2 | A/C | 4 | CK | SA | C | Passive | | | |
| | | | | | | | | | | AT-1 | App J | |
| KAV0118 | M-12KA02(Q) | D-6 | 2 | A/C | 4 | GL | M | C | Passive | | | |
| | | | | | | | | | | AT-1 | App J | |
| KAV0204 | M-12KA01(Q) | C-2 | 2 | A | 1.5 | CK | SA | C | Active | | | |
| | | | | | | | | | | CVT-O | CM | CVCM-02 |
| | | | | | | | | | | CVT-C | CM | CVCM-02 |
| | | | | | | | | | | AT-1 | App J | |
| KAV0648 | M-12KA05(Q) | G-6 | 3 | A/C | 0.75 | CK | SA | C | Active | | | |
| | | | | | | | | | | CVT-O | Q | |
| | | | | | | | | | | CVT-C | Q | |
| | | | | | | | | | | AT-3 | 2Y | |
| KAV0649 | M-12KA05(Q) | F-5 | 3 | A/C | 0.75 | CK | SA | C | Active | | | |
| | | | | | | | | | | CVT-O | Q | |
| | | | | | | | | | | CVT-C | Q | |
| | | | | | | | | | | AT-3 | 2Y | |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KAV0650 | M-12KA05(Q) | D-6 | 3 | A/C | 0.75 | CK | SA | C | Active | | | |
| | | | | | | | | | | CVT-O | Q | |
| | | | | | | | | | | CVT-C | Q | |
| | | | | | | | | | | AT-3 | 2Y | |
| KAV0651 | M-12KA05(Q) | B-5 | 3 | A/C | 0.75 | CK | SA | C | Active | | | |
| | | | | | | | | | | CVT-O | Q | |
| | | | | | | | | | | CVT-C | Q | |
| | | | | | | | | | | AT-3 | 2Y | |
| KAV0703 | M-12KA05(Q) | H-7 | 3 | C | .75x1 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 10Y | |
| KAV0704 | M-12KA05(Q) | F-6 | 3 | C | .75x1 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 10Y | |
| KAV0705 | M-12KA05(Q) | D-7 | 3 | C | .75x1 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 10Y | |
| KAV0706 | M-12KA05(Q) | C-6 | 3 | C | .75x1 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 10Y | |
| KAV0710 | M-12KA05(Q) | H-8 | 3 | C | .75x1 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 10Y | |
| KAV0711 | M-12KA05(Q) | F-7 | 3 | C | .75x1 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 10Y | |
| KAV0712 | M-12KA05(Q) | D-8 | 3 | C | .75x1 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 10Y | |
| KAV0713 | M-12KA05(Q) | B-7 | 3 | C | .75x1 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 10Y | |
| KBV0001 | M-12KB01(Q) | E-6 | 2 | A | 2 | GL | M | C | Passive | | | |
| | | | | | | | | | | AT-1 | App J | |
| KBV0002 | M-12KB01(Q) | E-6 | 2 | A | 2 | GL | M | C | Passive | | | |
| | | | | | | | | | | AT-1 | App J | |
| KCHV0253 | M-12KC02(Q) | B-6 | 2 | A | 4 | GA | MO | C | Passive | | | |
| | | | | | | | | | | AT-1 | App J | |
| KCV0478 | M-12KC02(Q) | B-6 | 2 | A/C | 4 | CK | SA | C | Passive | | | |
| | | | | | | | | | | AT-1 | App J | TP-12 |
| KJPV0001A | M-12KJ02(Q) | F-3 | 3 | B | 0.375 | TWY | SO | O | Active | | | |
| | | | | | | | | | | BT-O | Q | TP-05 |
| KJPV0001B | M-12KJ02(Q) | F-3 | 3 | B | 0.375 | TWY | SO | O | Active | | | |
| | | | | | | | | | | BT-O | Q | TP-05 |
| KJPV0101A | M-12KJ05(Q) | F-3 | 3 | B | 0.375 | TWY | SO | O | Active | | | |
| | | | | | | | | | | BT-O | Q | TP-05 |
| KJPV0101B | M-12KJ05(Q) | F-3 | 3 | B | 0.375 | TWY | SO | O | Active | | | |
| | | | | | | | | | | BT-O | Q | TP-05 |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KJV0711A | M-12KJ02(Q) | B-2 | 3 | A/C | 0.75 | CK | SA | C | Active | | | |
| | | | | | | | | | | CVT-O | Q | TP-01 |
| | | | | | | | | | | CVT-C | Q | |
| | | | | | | | | | | AT-4 | 2Y | |
| KJV0711B | M-12KJ02(Q) | B-2 | 3 | A/C | 0.75 | CK | SA | C | Active | | | |
| | | | | | | | | | | CVT-O | Q | TP-01 |
| | | | | | | | | | | CVT-C | Q | |
| | | | | | | | | | | AT-4 | 2Y | |
| KJV0712A | M-12KJ02(Q) | D-5 | 3 | A/C | 0.75 | CK | SA | C | Active | | | |
| | | | | | | | | | | CVT-O | Q | TP-01 |
| | | | | | | | | | | CVT-C | Q | |
| | | | | | | | | | | AT-4 | 2Y | |
| KJV0712B | M-12KJ02(Q) | D-5 | 3 | A/C | 0.75 | CK | SA | C | Active | | | |
| | | | | | | | | | | CVT-O | Q | TP-01 |
| | | | | | | | | | | CVT-C | Q | |
| | | | | | | | | | | AT-4 | 2Y | |
| KJV0716A | M-12KJ02(Q) | C-2 | 3 | C | .75x1 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 10Y | |
| KJV0716B | M-12KJ05(Q) | C-2 | 3 | C | .75x1 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 10Y | |
| KJV0717A | M-12KJ02(Q) | C-4 | 3 | C | .75x1 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 10Y | |
| KJV0717B | M-12KJ05(Q) | C-4 | 3 | C | .75x1 | RV | SA | O/C | Active | | | |
| | | | | | | | | | | RVT | 10Y | |
| LFFV0095 | M-12LF09(Q) | F-2 | 2 | A | 6 | GA | MO | C | Active | | | |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | AT-1 | App J | |
| | | | | | | | | | | BT-E | RC | TP-11 |
| LFFV0096 | M-12LF09(Q) | F-1 | 2 | A | 6 | GA | AO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | TP-04 |
| | | | | | | | | | | FST | Q | |
| | | | | | | | | | | PIT | 2Y | |
| | | | | | | | | | | AT-1 | App J | |
| LFHV0105 | M-12LF03(Q) | C-5 | 3 | B | 6 | GA | MO | C | Active | | | |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |
| LFHV0106 | M-12LF03(Q) | C-4 | 3 | B | 6 | GA | MO | C | Active | | | |
| | | | | | | | | | | OMN1-C | JOG | TP-11 |
| | | | | | | | | | | BT-E | RC | TP-11 |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SJHV0005 | M-12SJ04(Q) | F-7 | 2 | A | 1 | GL | SO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | TP-04 |
| | | | | | | | | | | FST | Q | |
| | | | | | | | | | | PIT | 2Y | |
| | | | | | | | | | | AT-1 | App J | |
| SJHV0006 | M-12SJ04(Q) | G-6 | 2 | A | 1 | GL | SO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | TP-04 |
| | | | | | | | | | | FST | Q | |
| | | | | | | | | | | PIT | 2Y | |
| | | | | | | | | | | AT-1 | App J | |
| SJHV0012 | M-12SJ01(Q) | F-7 | 2 | A | 1 | GL | SO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | TP-04 |
| | | | | | | | | | | FST | Q | |
| | | | | | | | | | | PIT | 2Y | |
| | | | | | | | | | | AT-1 | App J | |
| SJHV0013 | M-12SJ01(Q) | E-7 | 2 | A | 1 | GL | SO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | TP-04 |
| | | | | | | | | | | FST | Q | |
| | | | | | | | | | | PIT | 2Y | |
| | | | | | | | | | | AT-1 | App J | |
| SJHV0018 | M-12SJ01(Q) | F-3 | 2 | A | 1 | GL | SO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | TP-04 |
| | | | | | | | | | | FST | Q | |
| | | | | | | | | | | PIT | 2Y | |
| | | | | | | | | | | AT-1 | App J | |
| SJHV0019 | M-12SJ01(Q) | E-3 | 2 | A | 1 | GL | SO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | TP-04 |
| | | | | | | | | | | FST | Q | |
| | | | | | | | | | | PIT | 2Y | |
| | | | | | | | | | | AT-1 | App J | |
| SJHV0127 | M-12SJ04(Q) | F-6 | 2 | A | 1 | GL | SO | C | Passive | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| | | | | | | | | | | AT-1 | App J | |
| SJHV0128 | M-12SJ04(Q) | H-6 | 2 | A | 1 | GL | SO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| | | | | | | | | | | AT-1 | App J | |

| VALVE NUMBER | P & ID NUMBER | P&ID COORD | IST CLASS | IST CAT | VALVE SIZE | VALVE TYPE | ACT TYPE | SAFETY POS | ACTIVE/ PASS | TEST RQMT | TEST FREQ | ATTACHMENT REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SJHV0129 | M-12SJ04(Q) | H-5 | 2 | A | 1 | GL | SO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| | | | | | | | | | | AT-1 | App J | |
| SJHV0130 | M-12SJ04(Q) | G-5 | 2 | A | 1 | GL | SO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| | | | | | | | | | | AT-1 | App J | |
| SJHV0131 | M-12SJ04(Q) | B-6 | 2 | A | 1 | GL | SO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| | | | | | | | | | | AT-1 | App J | |
| SJHV0132 | M-12SJ04(Q) | A-6 | 2 | A | 1 | GL | SO | C | Active | | | |
| | | | | | | | | | | BT-C | Q | |
| | | | | | | | | | | FST | Q | TP-04 |
| | | | | | | | | | | PIT | 2Y | |
| | | | | | | | | | | AT-1 | App J | |
| SJV0111 | M-12SJ04(Q) | A-7 | 2 | A/C | 1 | CK | SA | C | Passive | | | |
| | | | | | | | | | | BT-C | Q | TP-12 |
| | | | | | | | | | | PIT | 2Y | |
| | | | | | | | | | | AT-1 | App J | |